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The Outlook

The Tudor Accident

SURPRISING as it is, the discovery that the cause of the accident to the Avro Tudor was the simple one of crossed aileron controls is not a unique example. Even in the early days of flying, when the control runs and the aircraft generally were far less complicated than now, there were cases of controls being crossed so that the control surfaces worked the opposite way to that which the pilot expected.

There was, for instance, in 1920 the "Centaur" twin-engined passenger biplane built by the now defunct Central Aircraft Company. In this instance it was the elevator controls which had been reversed. Then there was the Short Crusader, a seaplane entered for one of the Schneider contests. In this case the aileron controls were crossed and the machine crashed into the sea at Venice immediately after taking off. Fortunately, the pilot, Capt. Schofield, escaped with a ducking.

It is very easy to say that such things should not happen. That is agreed. But even in such an old-established and relatively simple form of transport as the railway accidents are occasionally caused by the momentary forgetfulness of a signalman. In spite of all our great progress in technical matters, the human element still plays an important part.

Before an aircraft flies, especially after work has been done on it and parts have been removed and re-assembled, there is a most careful inspection and testing of everything that has been touched, and it is difficult to imagine a chain of circumstances which could have led to overlooking the fact that in the case of the Tudor the aileron controls had been connected in reverse. But it did happen.

One of the first things dinned into a pupil when he is learning to fly is to test the flight controls to see that they move freely, to their full extent, and *in the right sense*. To do so soon becomes a habit. There is no reason to doubt that Mr. Thorn instinctively tested for the first two. It *is* possible that he either forgot the third or that, if he was unable actually to see his ailerons, he took it for granted that they were moving in the right sense. Even a pilot of such great experience can have a momentary lapse. We saw a case of that when the Dutch pilot, Geyssendorffer, omitted to notice that the lock on the elevators of his Dakota had not been removed. He was the oldest and most experienced of K.L.M.'s pilots, and one would have thought it impossible for him to overlook such an elementary precaution But he did overlook it.

It is, we believe, an Air Registration Board regulation that certain fittings in control runs must be of such different sizes as to preclude the possibility of making a wrong connection, but it is possible that the crossing-over occurred at some point not covered by the regulation.

While there must obviously be the strictest regulations, which must be conscientiously followed, legislation cannot by itself, as we have previously pointed out, ensure absolute safety. In the end it is the human element which decides, and unless that can be entirely eliminated there must be occasional mishaps. It ill behoves any of us to cast stones—particularly if we stop to reflect that each of us makes mistakes, probably daily. Fortunately for us, the penalties for our mistakes are not so heavy as those incurred by the crew, and especially the captain, of an aircraft.

Science and Politics

TECHNICIANS have a way of expressing, forcibly if not elegantly, their distrust of politicians, not least in connection with aviation. It is often felt that if only the development of flying were left to them, unfettered by international complications and Government policies—or the lack of them—progress would be much more rapid than it is.

In that very excellent speech which he made at the recent Guildhall dinner, the new American Ambassador,

Mr. Lewis Douglas, expressed this feeling remarkably well in connection with the joint meeting of the Royal Aeronautical Society and the American Institute of the Aeronautical Sciences. "The meeting of these two bodies," he said, "in an unrestrained and unfettered fashion is symbolic of the similarity of interests which bind our two countries together. If those who are actively engaged in the field of politics could have for their guidance the same objectives, if those who are so engaged enjoyed the same criteria which those who have taken part in the Conference enjoy, they would be able to view in their proper perspective the minor differences which sometimes appear to cloud the deep commonality of interest between us."

That sentiment will be heartily shared by aviation folk in both countries. The hope is, perhaps, a vain one. Self-interest is rampant throughout the world at the present time, and although science itself knows no frontiers, the politicians may attempt to raise barriers to the free interchange of views and ideas which was such a feature of the Anglo-American Conference. Should any such attempt be made, the two institutions must fight it tooth and nail. Between them they count some 12,000 members, scientists and technicians, and a united front should ensure that the work so well begun in London this year is allowed to go on and expand.

Good Work Well Done

SEPTEMBER, 1947, is likely to be a memorable month in the history of aviation. The period from September 3rd, when the Anglo-American Conference began, to September 14th, the winding-up of Radlett with a R. Ae S. Garden Party, there was almost unbroken activity. For the organizers, the work began many months ago.

Now that it is all over, and one can begin to sit back and view the somewhat hectic week in retrospect, what must be the verdict? We believe the vast majority concerned will agree that both the Conference and the S.B.A.C. Display should be counted complete successes. For that the credit must go not only to the "performers" but to those who, behind the scenes, worked so hard on the preparatory organization. Both the Royal Aeronautical Society, under the guidance of Capt. J. Laurence Pritchard, its secretary, and the Society of British Aircraft Constructors, headed by its chief executive, Mr. E. C. Bowyer, can feel well satisfied with good work well done.

Of the two, the task of the S.B.A.C. was, of course, the greater. It was no mean achievement to collect together so many of the right people from so many different countries, to see that their journeyings were made as easy and simple as possible, and to feed them when they finally reached Radlett. In addition, there was the task of organizing exhibits by nearly 200 firms. A few minor criticisms apart, the two organizing bodies deserve thanks for their efforts.

One criticism heard not infrequently at Radlett was that the general standard of flying was "not up to last year's." It was probably not generally realized that pilots had been given a mark on the airfield at which to aim, and that consequently they kept higher in the pull-out, surely a safe precaution. An accident would not have been a very good advertisement.

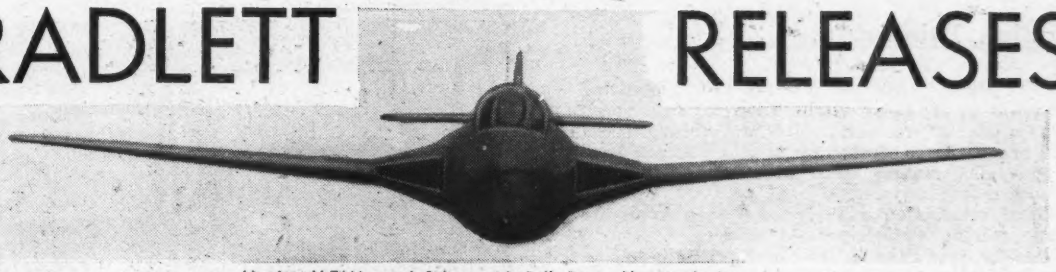
Conversely, there was some criticism of the steep climbing turns of some heavy transports after diving. The many demonstrations of manœuvrability with one or more airscrews feathered had, of course, a practical value.

CONTENTS

Outlook	305
Radlett Releases	307
Here and There	311
The Anglo-American Conference	312
Standardized Cockpit Design	315
The Guildhall Dinner	316
Radlett	317
Air Portraits	329
The R.Ae.S. Garden Party	333
Navy Display at Yeovilton	335
Helicopter Development	336
Civil Aviation News	338
Service Aviation	341
Correspondence	343

Forthcoming Events, page 344

RADLETT RELEASES

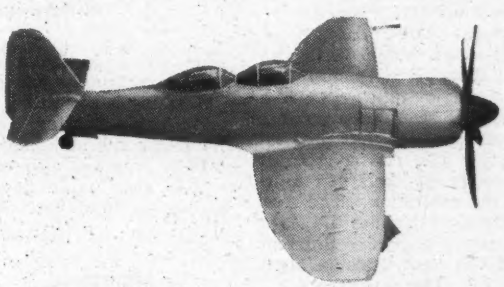


Hawker N.7/46 naval fighter with Rolls-Royce Nene turbo jet.

Trainers, Private-Owner Types and Helicopters

EVERY year at the S.B.A.C. Display particulars are released of new aircraft types sufficiently interesting and important to warrant a fuller notice than can be given in our general Radlett report. This year we are able to deal in some detail with the Avro Athena Mk II, the Hawker Fury Trainer, Auster Avis, Newbury Eon, Short Sealand, Fairey Gyrodyne, and Cierva W.11 and W.12.

Avro Athena Mk II: The Mk II version of the Athena trainer differs from the Mk I in having a Merlin 35 engine instead of a Dart or Mamba gas turbine. In the main the following structural description applies to both marks. Of two-spar light-alloy construction, the wing has pressed ribs and is built in five sections—centre section, two outer wings and two tips. The light-alloy skin is riveted in spanwise strips to the spar booms and ribs. Frise ailerons with spring tab control are fitted. The fuselage is assembled in two halves, the joints being on the vertical centre line. Monocoque construction is used, except at the cockpit opening where bending loads are taken by two longerons and the floor members. The pressed channel-section formers are notched to receive stringers of angle section, and the pre-formed skin is riveted to formers and stringers. The fin is integral with the fuselage tail.



A two-seat version of the Fury for training purposes.

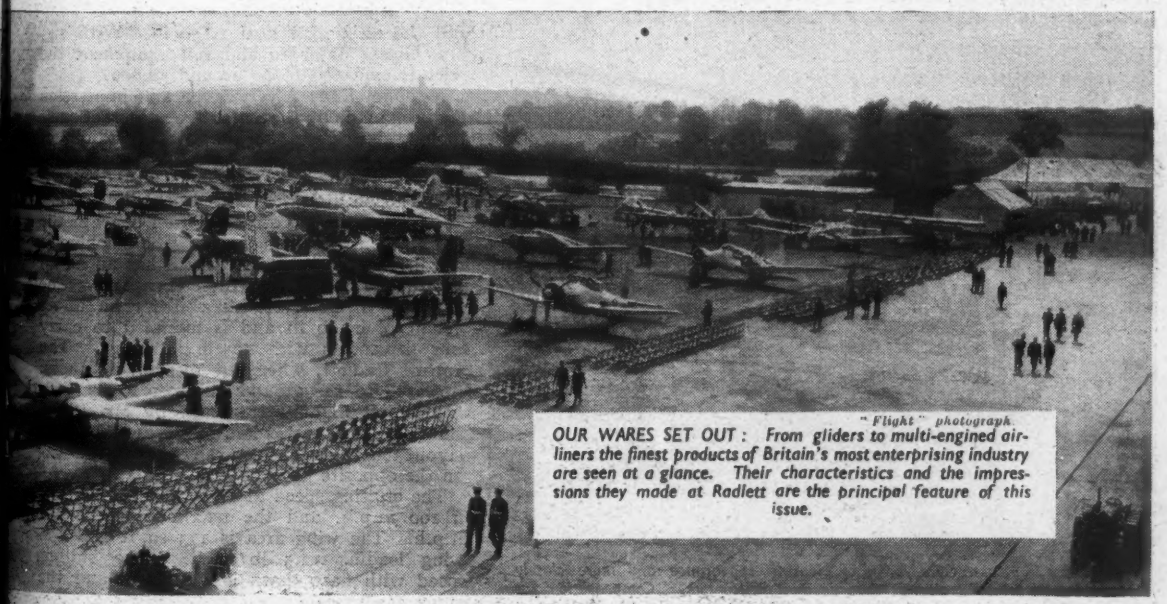
Side-by-side seating and dual controls are provided for the pilot and pupil, and there is a seat for a pupil/observer behind. To simulate night flying during daylight a two-stage amber screen is provided for the jettisonable cockpit canopy.

Of wide track, the undercarriage incorporates cantilever struts for the main wheels and a steerable tail wheel, the clutch mechanism for which can be disengaged by a lever in the cockpit.

The installation of the Rolls-Royce Merlin 35 engine, with its "beard" radiator, is extremely neat. Two fuel tanks, normally holding 130 gallons, are located in the centre section, and two drop tanks, each of 45 gallons capacity, can be fitted below them. The airscrew is a four-blade constant-speed de Havilland.

Provision is made for fitting transmitter-receiver 1143A, Standard Blind Approach or Rebecca Mk IV, and R3121 for identification. An earth-return wiring system is used, except in the outer wings where it is double-pole to eliminate interference with the compass flux valve in the starboard wingtip.

The following are the principal data concerning the



"Flight" photograph.

OUR WARES SET OUT: *From gliders to multi-engined airliners the finest products of Britain's most enterprising industry are seen at a glance. Their characteristics and the impressions they made at Radlett are the principal feature of this issue.*

Radlett Releases . . . . .

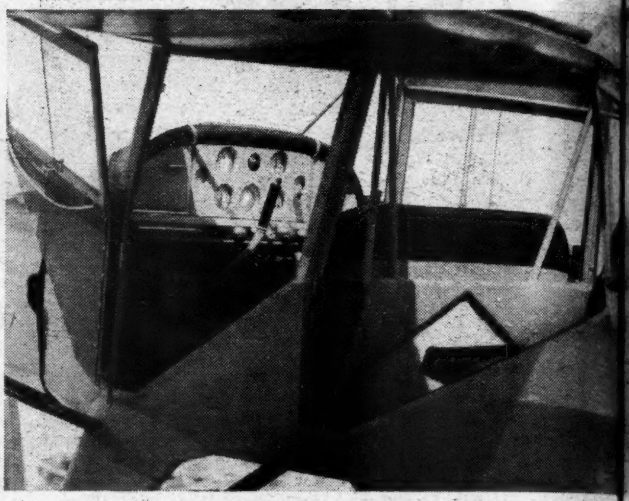
Athena Mk II: span 40ft.; length 38ft; gross wing area 270 sq ft; gross weight 8,210 lb; max speed 289 m.p.h. at 10,000ft; M.W.M. cruising speed 226 m.p.h. at 10,000ft; rate of climb at sea level 1,950ft/min; stalling speed with flaps 83 m.p.h.; service ceiling 26,750ft.

Great satisfaction was expressed that Avros are again making a single-engined trainer.

Hawker Fury Trainer: Developed primarily to convert pilots on to the Fury single-seat fighter, the Fury Trainer also meets a need for an advanced trainer of over 2,000 h.p. Equipped, like the Sea Fury, with folding wings, it is suitable for deck landing and accelerated take-off. A complete duplicate set of flying and engine controls is fitted in the instructor's cockpit, together with a standard set of instruments. Essential hydraulic controls are duplicated.

Although drawings issued on the Hawker stand show a built-up section between the two cockpit enclosures, the solution finally adopted is as shown in our sketch on another page. Like the Sea Fury X, the Fury Trainer is fitted with the Bristol Centaurus XVIII engine, which gives a maximum speed of 433 m.p.h. at about 20,000ft. Other data: normal all-up weight 11,280 lb; all-up weight with two 90-gallon drop tanks 12,810 lb; duration with max fuel 7 hours.

Auster Avis: It was very pleasing to see quite a number of new light aircraft at Radlett and to hear that progress with others is proceeding steadily. The Auster Aircraft Company sprang a surprise by producing their new four-seat Avis on the second day of the exhibition. The Avis is a quite new design but most closely resembles the Mark VI. The rear fuselage and undercarriage are different from previous civil versions, and the aerofoil-section flaps are similar to those of the Mark VI. The aim has been to produce an aircraft which will comfortably seat and carry four persons with 100 lb of luggage at a cruising speed of 100 m.p.h. The maximum speed will be 120 m.p.h. and the economical range 500 miles. The interior of the cabin is extremely attractive, and a very modern chocolate-and-cream instrument panel with artificial horizon and Murphy two-way V.H.F. radio are standard features. There are four large entry doors, and

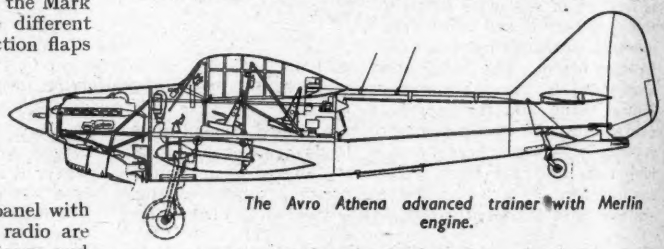


Auster's latest design, the Avis, is a comparatively roomy four-seater with four separate entry doors. Blind-flying instruments are included on the unusually smart panel.

when sitting in the rear seats the legs can be extended quite comfortably under the front seats.

Smoking is permitted, and cabin equipment includes ash trays, cabin lighting, ventilators and cabin heating, map compartments and luggage stowage.

It is proposed also to offer the Avis for freighter use with a clear cabin floor providing stowage for approximately 730 lb of merchandise. The gross weight is 2,550 lb and the disposable load 1,150 lb. With 145 h.p. Gipsy Major 10 and full equipment the price is expected to be around £2,000.



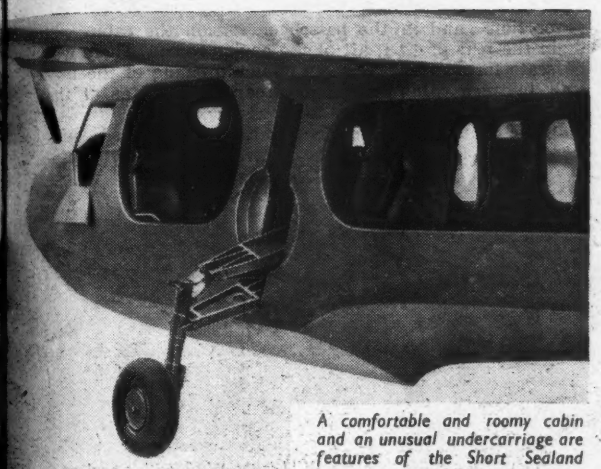
The Avro Athena advanced trainer with Merlin engine.

The Fairey four-seat Gyrodyne is of pleasing appearance and more closely resembles an orthodox aircraft than do most helicopters. Compensation for rotor torque is achieved with the use of an airscrew at the tip of the starboard stub wing.

Newbury Eon: A very favourable impression has been made by the attractive and practically thought-out Eon, the product of Elliots of Newbury, Ltd. At first glance it appears to have lines which were previously associated with French aircraft. This is chiefly because of its nose wheel protruding from beneath the 100 h.p. Cirrus Minor engine. The machine at Radlett is the prototype, which has an all-up weight of 1,950 lb with three occupants. The airframe is, however, stressed for an all-up weight of 2,150 lb and is intended to carry four passengers with 125 h.p. engine. The Eon at Radlett, when put through its paces, appeared to the ground observer to fly very well. Test flights were made by Mr. Philip Stanbury, and particulars of construction and layout may be studied in the cutaway drawing on the opposite page.

The cruising speed at 1,950 lb all-up weight is 100 m.p.h. and the maximum speed 112 m.p.h. The wing area is 173 sq ft and the wing loading 12.5 lb/sq ft. The stalling speed with flaps down is 43 m.p.h. and the range 350 miles.

Fairey Gyrodyne: Mr. Sikorsky recently men-



A comfortable and roomy cabin and an unusual undercarriage are features of the Short Sealand amphibian.

tioned that the helicopter is not usually regarded as a very good-looking aircraft, but that people who had been rescued by one described it as "the most beautiful thing they had ever seen." It would be an exaggeration to say that of the Fairey Gyrodyne, but it will probably be generally admitted that, for a helicopter, it is remarkably pleasant to look at. Perhaps this is due to the fact that there are stub wings, one of which carries an airscrew, and a normal tail with twin rudders.

One does not, of course, imagine that Dr. Bennett chose that particular configuration purely for æsthetic reasons. The peculiar and profound aerodynamics of rotating-wing aircraft indicate that certain advantages should accrue by using the torque-compensating rotor also as an airscrew. The first and most obvious is that instead of wasting its thrust, as does the tail rotor working in a longitudinal vertical plane, it contributes useful forward thrust. More important is the fact that it is hoped that, with the arrangement chosen for the Gyrodyne, the main lifting rotor will operate at a pitch angle fine enough to guard against tip-stalling of the blades, and that it will always be within the autorotative range.

Against these advantages is the fact that, as it is on a short lever arm compared with the tail rotor of the classical Sikorsky configuration, the airscrew of the Gyrodyne must absorb correspondingly more power during vertical ascent, leaving that much less for the main rotor. However, if power loading and disc loading are sufficiently low, vertical take-off and landing should certainly be possible.

The present Gyrodyne, which is all but ready for its first flight, should be regarded as a purely experimental type, and several changes may well be incorporated before it goes into production. For example, the rotor head mechanism is only one of several contemplated. During early spinning tests it was found that at the higher speeds there was a certain amount of vibration, but this was cured by adjustment of the blade damping.

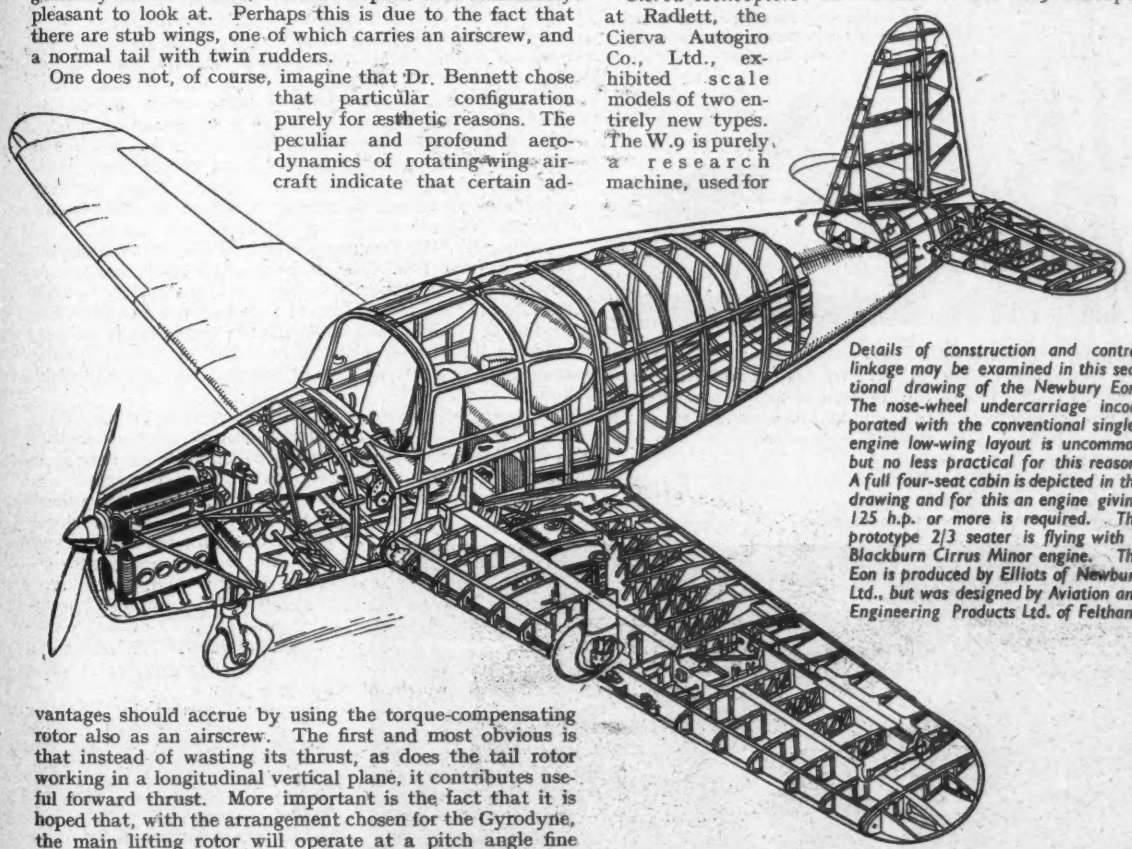
Power for the Gyrodyne is supplied by an Alvis Leonides engine, which gives some 500 h.p. for take-off. One of our pictures shows the transmission to rotor and torque-compensating airscrew. Incorporated is a Borg and Beck type of plate clutch, and to avoid risk of damage due to the inertia of the main rotor if the pilot should engage the clutch too abruptly, an actuator is used to bring the clutch in at a definite predetermined speed.

The drive shaft to the airscrew has rubber couplings at its inboard end and a Hardy-Spicer coupling at the outboard. The Lockheed hydraulic pump for control boosting is driven from the main rotor shaft so that, in the event of engine failure, it continues to function as the rotor autorotates. There is a large oil sump under the main gear box, and oil is forced up to the rotor head under pressure, returning by gravity through gears and shaft.

Provision is made in the comfortably large cabin for four people, including the pilot. During the flight-test period most of this space will be occupied by instruments.

Cierva Helicopters: In addition to the W.9 helicopter at Radlett, the Cierva Autogiro Co., Ltd., exhibited scale models of two entirely new types. The W.9 is purely a research machine, used for thoroughly testing various components. It has been a flying test bed for ascertaining the best forms of rotor-head details, controls and similar features.

As a result of much experimental flying done with the W.9, the company has come to the conclusion that large size, with correspondingly large payload, cannot be achieved by a single-rotor helicopter, and that, although



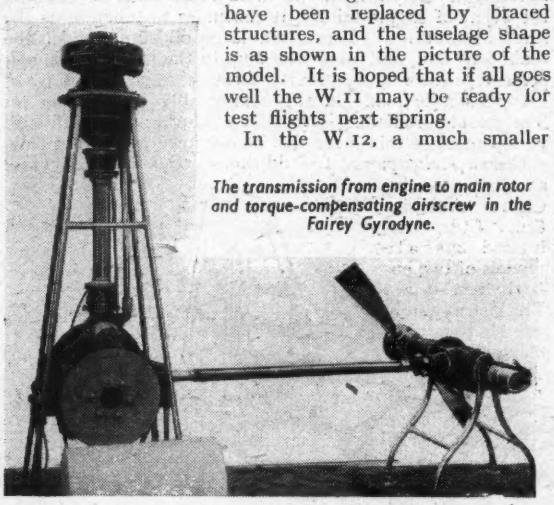
Details of construction and control linkage may be examined in this sectional drawing of the Newbury Eon. The nose-wheel undercarriage incorporated with the conventional single-engine low-wing layout is uncommon but no less practical for this reason. A full four-seat cabin is depicted in the drawing and for this an engine giving 125 h.p. or more is required. The prototype 2/3 seater is flying with a Blackburn Cirrus Minor engine. The Eon is produced by Elliots of Newbury Ltd., but was designed by Aviation and Engineering Products Ltd. of Feltham.

Radlett Releases . . . . .

the small helicopter will have its own field of usefulness, real commercial operation will only be achieved by machines with a useful load of one-and-a-half tons or over.

The policy of the Cierva Autogiro Co. will therefore in future be to design and build large helicopters, and the two models shown at Radlett represent two such types now being designed and built. The larger of the two, known as the W.11 or "Air Horse," will have a disposable load in the neighbourhood of 4 tons. It may be recollected that "Air Horse" was the name given originally to the W.10, a full description of which was published in our issue of July 4th last year. A full-scale mock-up of that machine was built, and the engine was to be a Merlin XXXII. The W.11 may be said to be evolved from that scheme, but very many alterations have been made, both to the fuselage shape and to the outriggers which carry the three rotors. In the W.11 the original cantilever beams have been replaced by braced structures, and the fuselage shape is as shown in the picture of the model. It is hoped that if all goes well the W.11 may be ready for test flights next spring.

In the W.12, a much smaller machine, the three-rotor arrangement has been retained, but the power plant is divided into two units, each mounted in the side of the fuselage in such a way as to be readily accessible on the ground, while during flight the engineer can reach many of the accessories likely to need attention.



The transmission from engine to main rotor and torque-compensating airscrew in the Fairey Gyrodyne.

Two versions of the W.12 are contemplated: a passenger machine and a freight-carrier. The fuselage is of ample proportions, and in the passenger version the cabin will be in the rear portion, aft of the engine room. There will be seats for 12 passengers, and soundproofing of the firewall between cabin and engine room, as well as of the cabin itself, is expected to afford real comfort.

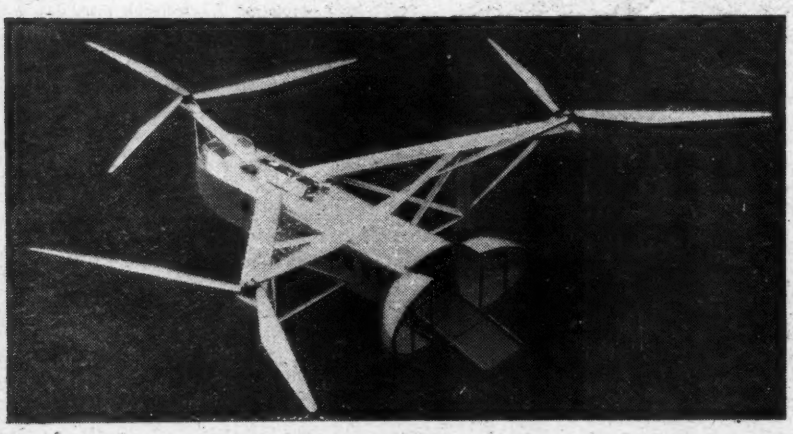
In the engine room there is, as already mentioned, sufficient space to inspect transmission and ancillary equipment. The former is so arranged that all three rotors can be driven by either engine or by both, but in case of engine trouble the power loading and disc loading are such that the machine can not only maintain height on one engine but can actually climb, although it is not to be expected that the rate of climb will be spectacular.

Similar to but smaller than the W.11 is the W.12, with a payload of 1½ tons or 12 passengers.

One of the problems of helicopter flight is the possibility of engine failure when within about a hundred feet of the ground. It takes some little time for the rotors to change from power-driven to autorotating flight. By having two engines, each capable of maintaining height, this risk is greatly reduced, but even if both engines should fail, the change-over to autorotation is performed automatically, and the long-travel undercarriage legs are capable of absorbing the energy of a high rate of descent. Thus the W.12 should be a particularly safe aircraft.

Outwardly, the freighter version of the W.12 is similar to the passenger machine, but the space inside has an unobstructed cubic capacity of 490 cu ft, measuring 11ft 3in long by 7ft 7in wide and an average headroom of 6ft. For loading the freight, two large, double hinged doors are provided in the after end of the fuselage. A built-in folding ramp allows of driving vans or private cars into the freight hold.

In both the passenger and freight versions of the W.12, the pilot and co-pilot (if carried) occupy a roomy cockpit in the nose, with a raised canopy which affords a very good view in all important directions. They are seated just below the sloping member which carries the drive-shaft from the engines to the single front rotor, but the upward and rearward view is not greatly interfered with by this member.



The Cierva W.11 three-rotor helicopter, here shown by a scale model, will have a disposable load of about 4 tons. Note the loading ramp.

SECOND SHETLAND LAUNCHED

A JOINT product of Short Bros and Saunders-Roe, Shorts having made the hull and Saro the wing, the second Shetland ultra-long-range flying-boat was launched at Rochester on Monday. With a span of 150ft the Shetland is the largest British aircraft and is capable of carrying seventy passengers and a crew of eleven. The first Shetland was destroyed by fire while moored at Felixstowe. Four Bristol Centaurus engines will give the second machine a top speed of 267 m.p.h. Engines of a more advanced type may eventually be fitted.

HERE AND THERE

RAIN READY-WRAPPED: A block of "dry" ice (carbon-dioxide) ready to be dropped into cumulus cloud in an attempt to accelerate the formation of rain by a local reduction of temperature.

Rain Makers

AN attempt to create artificial rain over an area of England by dropping 200 lb of dry ice (carbon dioxide) into cumulus cloud failed last week because over 300 miles of the country there was no suitable cloud. However, a similar experiment carried out by the Americans over Munich is said to have produced rain lasting for about 40 minutes. In Australia, where rain-making experiments with dry ice have been successful, a new method employing a preparation of calcium chloride is to be tried out by the Australian Council for Scientific Research. Ground radar stations are to check the area of rainfall.

D.S.I.R. Scottish Office

TO facilitate closer contact with Scotland, the Department of Scientific and Industrial Research has opened a Scottish office at 18, Melville Street, Edinburgh. The office will have a dual function—to encourage the prosecution of research by industry itself and to increase the effectiveness of the contributions which existing Government research establishments make to Scottish industry. The new office will co-operate with the Departments of the Secretary of State for Scotland, with the organizations in Scotland of other Government departments, and with voluntary bodies such as the Scottish Council (Development and Industry). It will also study the Scottish industrial position with a view to assisting in the formulation of problems suitable for research.

The office will take appropriate steps to ensure that any discoveries of pure science which may be capable of industrial application will not be overlooked and that opportunities for new development are not missed.

Dr. H. Buckley will be in charge of the new department.

Record Jump

MOSCOW radio has announced that Colonel Romaniuk has set up a new parachute descent record by jumping from an aircraft at a height of 43,962ft. The report adds that Colonel Romaniuk opened his parachute as soon as he was clear of the aircraft, and it took him 21 minutes to reach the ground. Upon landing Colonel Romaniuk stated that it was so cold that frost penetrated his kit. Two other Soviet parachutists also made jumps from 41,016ft and 40,338ft.

Soviet Pest Control

THE S.D.A.S. (Special Duty Air Service), a body of pilots which uses hundreds of aircraft and has bases throughout the Soviet Union, is soon to launch the largest attack on agricultural pests the country has ever known. Chemicals will be sprayed from the air in all regions where locust and other crop-devouring pests have been reported.

Besides looking after the interests of farmers, shepherds and cotton planters, the S.D.A.S. engage in photographic surveying, power-line patrols and the transport of baby chickens and ducks from central incubators.

"Flight" photograph

FROM OUR OLDEST ALLY: Sir Richard Fairey shows Mr. Byard Dill the medal presented by Comando Superior Forcas Aereas da Armada, Lisbon, commemorating the 25th anniversary of the first crossing of the South Atlantic in 1922 by Admiral Gago Continho and Commander Sacadura Cabral in a Fairey Seaplane with Rolls-Royce Eagle engine. A similar medal was also presented to Mr. Hives, the Managing Director of Messrs. Rolls-Royce.

Stratosphere Research

MANY interesting problems are being solved at the Weybridge works of Vickers-Armstrongs, Ltd., where the world's largest stratosphere chamber is in course of construction. The chamber consists of a cylinder 25ft in diameter and 50ft in length, which will be used to test aircraft cabins for pressurization and heating and the behaviour of aircraft structures, controls and engines under conditions likely to be encountered in flight. It is capable of reproducing temperatures and pressures found up to 70,000ft, and a vacuum pump can reduce the pressure within the cylinder at a speed corresponding to an aircraft's rate of climb at 1,000ft/min. The chamber is expected to be ready by the end of the year.

News in Brief

AT the invitation of the Polytechnic Touring Association, air hostesses of the Poly Vikings—the chartered aircraft used by the P.T.A. for their "holidays in Switzerland" flights, are themselves having brief holidays at Interlaken.

* * *

During the twenty-seven years that K.L.M. have used Croydon airport some 40,000 landings and take-offs have been made there. In 1947 over 1,600 flights were made between London and Amsterdam, carrying 22,624 passengers and 600 tons of freight.

* * *

A Gemini belonging to the Missionary Aviation Service was dedicated and named *Mildmay Pathfinder* by Mrs. Thomas Cochrane, wife of the President of the Mildmay movement, at Broxbourne recently. The aircraft is to be used to link up missionary outposts in Africa and to transport sick persons to base hospitals.

* * *

The W.J.A.C. Fairchild Argus will be visiting Finningley Airfield, Yorks, on Saturday and Sunday, September 20th and 21st, to provide training flights for officers and cadets of the Corps.

The Anglo-American Conference

Three Further Lectures Summarized : Sweepback : Airscrew-Turbines : Helicopters

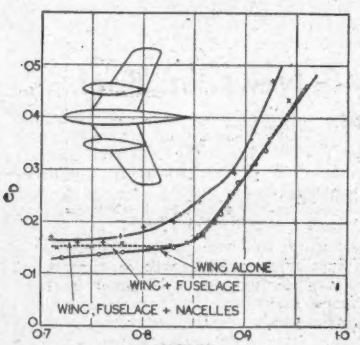
Practical Design and Problems Arising from Sweepback

By E. J. Richards, M.A., B.Sc., A.F.R.Ae.S.

AFTER stating that there are many sweepback problems, particularly on high-altitude transport aircraft which have not really been touched upon yet, the lecturer, who is Chief Aerodynamicist of Vickers-Armstrongs, Ltd., went on to give a broad review of the many problems involved in the use of sweepback. Mr. Richards agreed that whilst sweepback has a beneficial effect on critical Mach number, the quantitative gain to be expected is difficult to assess owing to the paucity of test results available and thus the impossibility of satisfactory rules being propounded.

Mr. Richards then went on to deal with the effect of fuselage and nacelles on sweepback characteristics and in this connection suggested that, as shown in the accompanying illustration which indicates the serious adverse effect that improperly designed wing nacelles could have on the critical Mach number, it would appear that nacelles will need to be underslung or to be so well faired over as to be considered as part of the wing itself. There is thus urgent need for small power units which can be buried completely in the wings.

On the score of wing weight, the lecturer observed that, apart from the increased structural span of wings with sweepback, consideration of aeroelastic distortion at the increased speeds will undoubtedly affect wing weight considerably, and it is thus difficult to estimate with any great accuracy what weight increase arises directly from sweepback, but probably the best indication is given by an empirical formula developed at the R.A.E. where, if the basic aspect ratio, t/c ratio and wing loading are retained, an increase of wing weight with angle of sweepback which is roughly proportional to the secant of the sweepback angle will be incurred. Thus, for forty degrees sweepback the wing weight will be increased by about four or five degrees of the all-up weight.



Effects of body and nacelles on critical Mach number plotted against drag.

The advent of sweepback, suggested Mr. Richards, is not going to postpone the necessity for the complete solution to the change of trim problem in the presence of shock waves but, on the contrary, is going to aggravate it by the addition of two more variables, sweepback and speed : since also the speed will be higher, the onset of the changes of trim can be expected to be more severe. Aircraft will, increasingly, be designed of necessity with a very limited scope of speed development so that it is imperative that engine designers should state boldly the anticipated development in thrust and fuel economy during the next ten years so that airframe designers can be equally bold in allowing for them.

In terms of manœuvrability the lecturer stated that model tests on complete aircraft demonstrated that for the normal types of wing section, the maximum lift has fallen to such an extent at the Mach numbers made possible by sweepback that it is impossible to fly straight and level without stalling. Tunnel tests at the R.A.E. demonstrate this quite clearly and also show that there is an apparent advantage from the use of lamina flow aerofoil sections on the wings.

With sweepback, wing bending, as well as wing torsion, gives rise to changes of incidence and unless considerable care is taken at the design stage, losses of longitudinal stability of ten per cent of the mean chord can easily be obtained. This can quite easily result in high speed instability which will disappear as speed is reduced and give way to excessive stability at low speeds. Probably the best way to reduce this stability loss, suggested Mr. Richards, is by designing the tailplane to distort in a predetermined manner. With large sweepbacks, it may be worth while to design the tail as an all-movement trim, elastically mounted without an elevator, longitudinal control being obtained by means of elevons on the wings.

On the subject of design problems at super-critical speeds, Mr. Richards observed that the remarkable advancement of jet engine efficiency had produced the condition of our having to design for these super-critical speeds on high speed fighters and bombers at higher Mach numbers than ever before with the added variable of sweepback. Wind tunnels are of little use in this connection and, although the dropped model and the guided rocket had offered some alleviation, it cannot be gainsaid that designers will have to find out their problems the hard way by constructing their aircraft and putting them right after they show their flying characteristics, and, whilst this is most unsatisfactory, it is, in the circumstances, the only way of proceeding. After considering the main suggestions for counteracting tip stall qualities, Mr. Richards went on to review the other class of sweepback, that is, twenty to thirty degrees, in which tip stall is not apparent, citing the example that it is possible with a thirty degree sweepback to avoid tip stall if the aspect ratio is below five.

On the subject of flaps, the lecturer stated that whilst a normal gain in maximum lift is obtained with small and moderate sweepback, the overall gain is zero or even negative with angles of forty and fifty, the flaps acting purely as an incidence reduction device. We have, therefore, to develop entirely from scratch new methods of lift increase which will still operate for these large angles of sweepback.

In connection with gust alleviation, Mr. Richards agreed that whilst this problem is not in any way confined to swept-back wings, the advent of sweepback has resulted in flight at much higher speeds and lower wing loadings, both of which aggravate gust accelerations very severely, and there is an undoubted need for some form of alleviation device which will respond about twice as quickly as those at present envisaged. With swept-back wings it may be possible to make more use of the inherent alleviation resulting from aeroelastic distortion, but it is impossible to say whether this can be accomplished without losing stability or increasing the danger of flutter.

WE give hereunder and on the following pages summaries of a further three lectures given before the joint convention of the Royal Aeronautical Society and the American Institute of the Aeronautical Sciences which, opened by Sir Frederick Handley Page on September 3rd, ended with a banquet on September 9th, at the Guildhall, London. Additional lectures will be included in subsequent issues.

The Propeller-Turbine Aero Engine

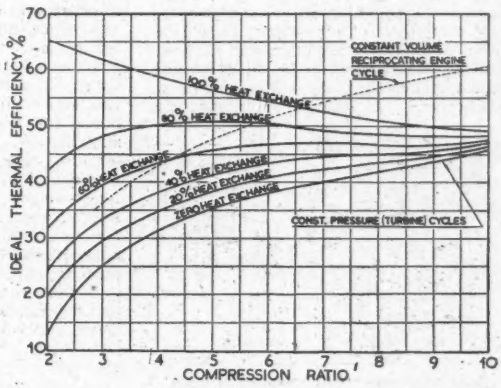
By F. M. Owner, M.Sc., M.S.A.E., F.R.Ae.S.

MR. OWNER who, as Chief Engineer of the Bristol Aeroplane Company, has been chiefly responsible for the design of the Bristol Theseus and Proteus airscrew turbines, after briefly reviewing the specialist claims of the piston-engine/airscrew, gas-turbine/airscrew and pure jet forms of propulsion, in conjunction with the operating conditions favoured by each, suggested that, for the next fifteen years, cruising speeds of large transport aircraft will not exceed 500 m.p.h., and thus they will not fly at much above 40,000 feet. This is the acknowledged reserve of the airscrew turbine.

In considering airscrew-turbine design, the lecturer stated that the prime requirement in attaining thermal efficiency is to remove heat from the exhaust jet, since, although this reduces the jet thrust, the energy thus abstracted can be more efficiently utilized by being fed to the airscrew. Of the means whereby heat energy may be thus converted the choice

rests between the use of a heat exchanger and high compression. Mr. Owner then went on to consider the thermodynamic aspects of these alternatives, illustrating that, when high overall thermal efficiency is the criterion, at speeds of the order of 300 m.p.h. it pays to take about 20 per cent of the thrust power in the form of jet reaction as this reduces airscrew weight without otherwise materially influencing the performance.

On the score of engine layout Mr. Owner postulated that easily the most important single factor is the high volume flow to be dealt with at the intake and exhaust pipes, this being of the order of 1lb air/min./h.p., and every care must be taken to avoid loss of head in the intake by bends, etc. The need for avoiding bends in flow after compression is not so acute. Another important factor controlling design layout is power at take-off. The airscrew may be driven direct from the compressor-turbine system or by a free power-turbine, the only exponents of the latter system at present being Bristol turbines. Airscrew location is a further question, and although no pusher turbine installations are known as yet the gas turbine lends itself conveniently to a pusher layout with, however, an important reservation on the score of vibration.

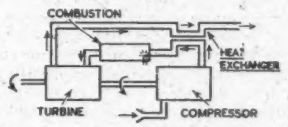


Comparison between ideal efficiencies of gas-turbine and piston engine. Percentage heat exchange means change in gas temperature through exchanger expressed as a percentage of the extreme temperature difference causing the heat flow.

Referring to compressor systems, Mr. Owner remarked that any very marked increase in axial compressor performance and efficiency is unlikely in the immediate future until such time as the Mach Number effect has been mastered. A point in which the airscrew-turbine differs essentially from the jet unit is that considerable centrifugal and gyroscopic moments may have to be transmitted through the compressor outer casing to the mounting points, in addition to the torque reaction. Again, where a free power-turbine is used to drive the airscrew, a passage for the shaft has to be made through the compressor discs. This tends to heavier construction and may in future impose a limit on the design.

The effect of component efficiency on overall efficiency makes it not surprising that all present-day turbines are of axial flow type, but good reasons exist for believing that, especially in the small sizes, it might be well worth while investigating the characteristics of the inward, centripetal-flow type with axial discharge, i.e., a centrifugal impeller with the flow reversed. In referring to the design of turbine blades, Mr. Owner suggested that a useful solution to the problem of blade form might be found in the choice of a Mach Number approximately constant with radius for turbines as well as compressors, and he went on to say that by far the hardest technical problem in turbine design lies in the matching of the turbine characteristics with those of the compressor.

A very direct approach to the problem of increased thermal efficiency is offered by the heat exchanger. However, two fundamental features impose restrictions on its design and utilization which make its practical realization somewhat difficult, these features being, in order of significance, weight and volume. Two further parameters in addition to those of weight and volume may be specified as affecting the performance of the engine. The first of these is thermal ratio, and the second is effective pressure drop which may be defined as: exhaust pressure drop + $\frac{\text{charge pressure drop}}{\text{turbine expansion ratio}}$ and it has been shown that whilst the pressure drop across the "cold" side is of minor importance the pressure drop across the "hot" side must be reduced to a minimum of about 0.05 to 0.1 of the local atmospheric pressure. In dealing with heat exchanger form the lecturer suggested that the ideal is possibly a series of smooth flat plates, an attempt at such a design being given in what has been termed the cross-flow secondary surface exchanger. Such a design gives a very compact assembly but has so far proved difficult to manufacture; it would appear, however, to have a promising future when these problems are mastered. An alternative form of heat transfer system which has received extensive theoretical investigation is the regenerative cycle type, for which attractively high efficiencies have been claimed. In this arrangement the charge and exhaust gases are caused to pass through the system alternately at a pre-determined frequency, so that the heat absorbed during the passage of the hot exhaust gases is subsequently given up to a following and relatively cold charge, effecting a highly efficient heat transfer method.

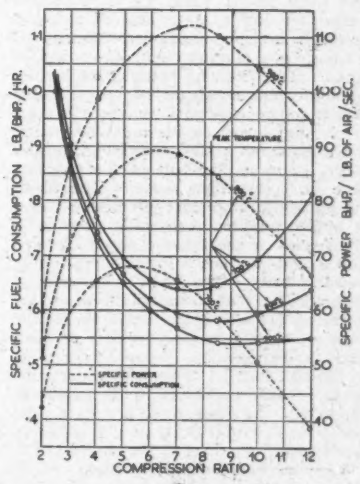


In dealing with development aspects Mr. Owner remarked that one of the major difficulties with airscrew-turbines in obtaining consistency of results lies in the fact that the useful power is actually less than half the power developed by the turbine. Hence small variations of turbine and compressor characteristics can have a surprisingly large effect on the useful power produced, thus exaggerating the effect on such items as compressor fouling and ground level atmospheric dirt.

Under the head of operation, the lecturer emphasized that to obtain optimum operating conditions for an airscrew-turbine there are three main factors which can be varied either independently or in some predetermined relationship to each other. These are: (1) fuel flow; (2) airscrew pitch; (3) exhaust nozzle area, and in connection with the last of these, it was stated that variation in the area has two distinct effects on the operation of a gas turbine: it controls the position of the operating point on the compressor characteristics and also regulates the division of output between the airscrew and the jet.

Mr. Owner later went on to refer to the problems of coupled units, and observed that the most important is concerned with vibration, due to the fact that several modes occur in the region of the complete power plant and its support, which arise from various sources. These are broadly attributable to the aerodynamic interference of the contra-rotating airscrews giving rise both to torsional and flexural vibrations, which may react on the natural frequency of the airscrew-cum-reduction gear on its mounting. In addition there is the natural frequency of the engines on their respective mountings, and the local frequency of the aircraft wing structure. It is evident that the complete vibratory system in this region is extremely complex, and that only by actual running of a truly representative system can a full exploration of any one particular design be made.

To terminate his paper the lecturer suggested that, in connection with prob-



Effect of compression ratio on airscrew-turbine performance. All power is assumed as given to the airscrew, and the turbine adiabatic efficiency is taken as 85 per cent.

The Anglo-American Conference . . . .

able future development, it is paradoxically true that the airscrew-turbine stands less in need of development of a radical nature than of consolidation of its present possibilities, and there can be no doubt that absolute priority in this case should be given to improvement in thermal efficiency with consequent reduction in fuel consumption. Further, so little attention has, by comparison, as yet been paid to fuels for gas-turbines that it is difficult even to indicate the possibilities at this stage. The utilization of heavier grades of fuel, which is so desirable on the score of safety and economy, may be checked by lesser calorific value per pound weight, and the kerosene now in general use represents the best available all-round compromise although its continued use seems to depend upon the supply position.

Helicopter Power Installation

By Robert A. Wolf and Carl P. Spiesz

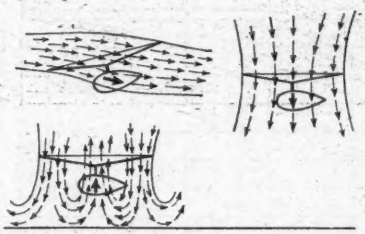
THE authors of this paper are respectively the Helicopter Design Engineer and the Power Plant Group Engineer of the Bell Aircraft Corporation, and the paper was presented at the meeting by Robert M. Stanley, Vice-President and Chief Engineer of the Bell Aircraft Corporation.

Mr. Stanley initially observed that there is much current speculation about the ideal power plant for to-morrow's helicopter and a great deal of analytic research is being conducted towards an ultimate goal of a successful jet-controlled rotor. This is being spurred on by the obvious shortcomings of present-day piston-engine applications where a relatively high-speed engine must be geared down to drive a slow-speed high-torque rotor. This is also true of the gas turbine in a magnified sense. The blade tip-jet appears to offer promise because it might produce reasonable propulsive efficiencies at the fast-moving blade tips and would produce a lightweight simple power plant. The basic deficiency of high specific fuel consumption would be offset by the weight-saving in the power plant, and this scheme appears to be a reasonable objective, especially in view of the fact that jet drive system performance is susceptible to quite accurate theoretical analysis and much of the groundwork could be done on paper at small cost.

The authors believed that a jet "boost" system where jets may assist the normal engine during the critical take-off and hovering phases of operation will probably be the interim development between to-day's practice and the completely jet-driven helicopter of to-morrow.

Since power plant weight is so important to the helicopter this is always the first subject of discussion in considering design. It can generally be taken that the helicopter power plant absorbs about 65 per cent of the useful load of the machine and about 20 per cent of the gross weight, and it is interesting to note that, in this respect, it ranks close to the single-seat fighter which is essentially a flying power-plant with emphasis on low power-loading and super high speed performance.

Contemporary helicopter power plants weigh from 2.5 to 3.5 lb/h.p. including transmission, fuel systems, rotor drives, etc., and the engine proper consumes approximately half of the total installation weight. The available "small" engines in common use to-day are too heavy for their power output, their cooling characteristics are poor, and they are not designed to utilize the supercharging which makes the large piston engine so attractive. At the present time, the helicopter market potential is somewhat obscure, especially as to proper engine size, and most engine manufacturers seem to be reluctant to expend the large funds necessary for the development of a real helicopter engine incorporating all of the known improvements available in the large engines.



Rotor slipstream characteristics as modified by ground effect and forward flight.

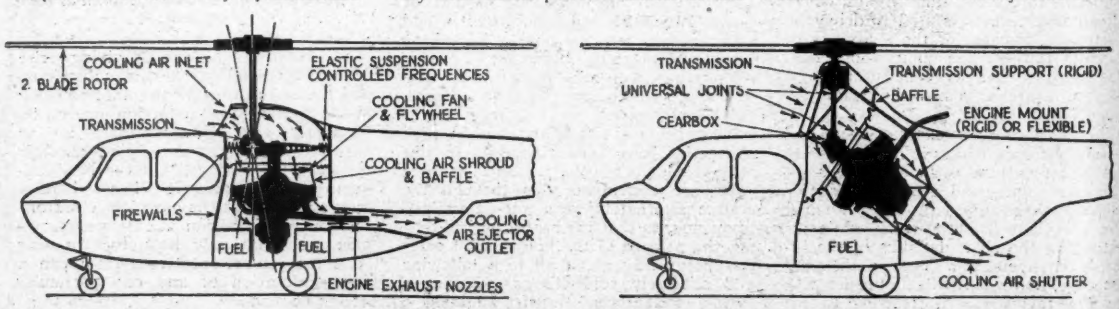
In pointing out some of the basic differences between the power required to fly a helicopter as compared with orthodox aircraft of the same gross weight, Mr. Stanley observed that the horse-power required to hover at zero speed is very large compared to the minimum power required at significant forward speeds either for the helicopter or the fixed-wing aircraft. This hovering horse-power requirement represents the major consideration in selection of the helicopter power-plant and there is normally very little excess power available at this point for climb, maladjustment, temperature changes, etc. It can thus be seen why power-plant weight and load-carrying capacity of present-day helicopters are such critical factors. However, it is quite conceivable that to-morrow's cargo helicopter, if designed for specific operation where small airports are available and pure hovering is not required, will be equipped with proportionately small power plants or will carry greatly increased loads, thus providing good airport economy. If short ground-runs are available to the helicopter, it can take-off at reasonably low powers with loads comparable to those of fixed-wing types.

Refinement of the helicopter by way of reducing body, landing-gear and pylon drag will tend to produce the effects of greater aerodynamic efficiency, and constant improvement can be expected in this direction; however, the emphasis of designers to date has been placed upon improvement of the hovering characteristics, since this is the real *forte* of the helicopter.

When examining a power-required curve for a helicopter, it is easy to see the wonderful possibilities of short-term boost for hovering and take-off, thus allowing the helicopter to get into the air and gain forward speed to a point where normal power will sustain flight. Light-weight power-boosts which can deliver short-term spurts of the order of 50 per cent normal engine power would produce tremendous increase in the load-carrying capacity of the helicopter, and it is such speculation that is leading to the development of jet-boost systems like Doblehoff and others. Consideration is also being given to blade-tip rockets, athodyds, etc., for a spurt boost-power.

In considering the power-plant for a given rotor, two major characteristics must be reckoned with, viz., the hovering power required by the rotor, and the envelope of blade-stall with its inherent altitude and speed. Blade-stall is encountered in the high-speed range on the retreating blade, this being due to the low relative wind and the high angle of attack which must be maintained by the retreating blade to give reasonable balance of lift.

Going on to consider installation problems, the paper emphasized the importance in choosing the location of air inlets and outlets serving the engine. This presents a unique problem on the helicopter because of the lack of ram pressure during hovering, and due to the eccentric airflow patterns characteristic of rotary-wing aircraft. Since the engine must be cooled by means other than ram pressure, the cooling air inlet need not be of the ram type; however, it is desirable to utilize the available velocity head of for-



At left is shown a rigid pylon installation with semi-ram cooling, and at right is shown the Bell-42 flexible pylon layout in conjunction with flywheel-fan and exhaust-ejector cooling.

The Anglo-American Conference . . .

ward flight if this can be done at an efficiency equal to, or better than, that of a cooling fan. However, there is another consideration to the use of a cooling fan in helicopter power plants, this being what can be termed the flywheel function The inertia of the fan must be adequate to provide satisfactory idling characteristics of the engine since the rotor is not engaged during the starting and idling phases of engine running. Of course, the fan must also be light. This controversy must be settled by the designer, but it has been established that a well-designed helicopter cooling fan will weigh from 0.05 to 0.08 lb/b.h.p.

Realization of the power cost of cooling with a fan leads to a search for substitute methods and one thus comes to the exhaust ejector. Satisfactory ejectors can be built at a weight of from 0.075 to 0.09 lb/b.h.p., falling roughly in the same weight category as a cooling fan.

After touching briefly on suspension methods, Mr. Stanley went on to consider the vertically mounted engine, commenting that although this is not a "must" it has the advantage of very direct drive to the rotor with inherent simplicity and low weight. Most single-rotor and some multiple-rotor craft have the power plant located within the body, thus being classed as "submerged" installations and, since the rotor loads are applied near the top of the body and the landing-gear loads near the bottom, there must be continuity of structure between these points; unfortunately, the structure has a wonderful affinity for blocking accessibility to the power plant. Of all major components of the helicopter, the power plant zone is probably the most critical from the access viewpoint.

Turning to the subject of a better helicopter engine, Mr. Stanley pointed out some desired trends in piston-engine development to make this type of unit more suitable to the specific needs of the helicopter. He stated that considerable improvement in power/weight ratio is needed and, particularly, considerable research should be devoted to cooling requirements since reduction of power required for cooling pays big dividends in any helicopter. There is also a definite case for supercharging in the small engine class, especially if the engines are designed to make boost-power available at sea level for take-off and hovering. Methods of maintaining approximately constant engine speed at powers varying from 50 to 100 per cent h.p. are required to suit both the cruising and hovering conditions of flight, since the helicopter rotor operates at approximately constant speed. Much research, too, is needed in the matter of determining minimum flywheel requirements from the standpoint of starting, idling and accessory drive inertias and, as a last but particularly important point, it is essential that it can be mounted either vertically, horizontally or in an inclined position without redesign of lubrication or accessory systems.

Standardized Cockpit Design

Risk of Too Many Standards : The Need for International Agreement : A Case for Functional Arrangement

THERE are definite indications that both here and in America great efforts are being made to simplify and improve the layout of cockpits, and the problems are being tackled in several ways. In addition some degree of standardization both of controls and instruments is being sought for all aircraft. There is, however, a real risk that the principal purpose of these praiseworthy individual endeavours may be defeated because too many groups tackle the subject without knowledge of each other's work. For example, the Air Ministry in this country may appoint a committee to study and recommend, some of the major aircraft companies here and in America may also be tackling the subject, and the U.S. Navy also has a study group. If and when these groups eventually get together each may have proceeded so far that it would be too late to consider the pooling of ideas. The need for international planning is, however, most obvious.

Some views on the subject of layout were expressed in a paper read before the S.A.E earlier this year, and summarized recently in the Society's journal. The author was Commander N. R Richardson, cockpit development co-ordinator of the U.S. Navy Bureau of Aeronautics. He dealt with his subject under a series of headings—the basic principles of cockpit design—and the main points were as follows:—

(1) *Transfer of control*: The pilot should not be required to transfer control of the aircraft from one hand to the other during take-off and landing. Commander Richardson remarked that the principle had been violated for years. For example, landing gear, flaps and canopy control were located on the right-hand side of the cockpit, which meant that immediately after take-off the pilot was required to remove his left hand from the throttle, transfer it to the stick and fly left-handed while he operated these controls.

(2) *Transfer of vision*: On many aircraft it was necessary for the pilot to look inside the cockpit at a critical period to find controls.

(3) *Controls forward for take-off:* For years there was no rhyme or reason for the way in which many important controls operated. For example, airscrew controls were mounted on the aft end of the power control quadrant and moved up and down rather than fore and aft as was the throttle. Some installations actually had the idle cut-off position at the forward end of the quadrant, just beyond the full rich or take-off position. The author concluded that certain controls should operate fore and aft and that they should be forward for take-off, making it simple for the pilot and almost foolproof.

(4) *Motion of controls to correspond with motion of equipment operated*: Although the principle would on occasion seem to conflict with the "forward for take-off" rule it was logical then to apply the one that made the most sense. For example, the landing gear was operated in a vertical plane—up for wheels up and down for wheels down. Flaps were in a similar category.

(5) *Separation of controls*: In many aircraft the flap and landing gear controls were in the same area and often side by side. Just how many crashes this had caused would never be known. They were now located in different areas of the cockpit where they would be operated in a logical sequence.

(6) *Combination of controls*: In many aircraft emergency or auxiliary controls were located in remote recesses. The aim was now to combine the normal and emergency controls in one, or at least have them adjacent where the pilot could find them and operate them with a minimum of time and effort.

(7) *Economy of motion*: In many cockpits there was no thought given to the location of controls that must be operated in sequence.

(8) *Economy of time:* Controls must require a minimum of time and effort to operate on the part of the pilot. It was required that the pilot only take the time necessary to flick a control or switch rather than hold it during the cycle of operation.

(9) *Functional arrangement of controls*: By making controls remote operating it was possible to make them small and locate each one where it should be from the functional viewpoint.

(10) *Streamlining*: The first step in fairing-in equipment was the development of radio and electrical consols. Shortly afterwards the same consol treatment was applied to all power plant and trim tab controls on the left-hand side of the cockpit. The result was surprising. Despite the addition of many controls the cleaned-up versions looked simpler and were easier to operate.

(11) *Crash and injury hazards*: Efforts were still being made to get all equipment cleaned up and recessed and all sharp objects had been removed or faired in. More attention was being given to body clearances, head, knees and elbows.

Commander Richardson then commented on seating, pilot escape (with special reference to ejector seats). Of the prone position he said "We must know much more about human limitations under high negative and positive accelerations before we know whether prone cockpits are desirable." He added also "We know that pilots must be comfortable if they are to be effective and safe." We were now faced with high-speed aircraft and still did not know if noise or vibration would be problems.

The Guildhall Dinner

Historic Conclusion of Anglo-American Conference

NOTHING could have provided a more fitting finish to the Anglo-American Aeronautical Conference than the dinner in London's ancient and war-scarred Guildhall, held on September 9th. The Royal Aeronautical Society, the oldest of its kind in the world, and the Institute of the Aeronautical Sciences, America's 15-year-old counterpart, met for a final good-fellowship gathering before the U.S. delegates to the conference, after visits to the S.B.A.C. Display, returned to their own country.

At one end of the Guildhall were displayed the Union Jack, the Stars and Stripes, and the banners of the City of London and the Royal Aeronautical Society. The orchestra of the Central Band of the R.A.F. provided music during dinner, and Grace and Thanksgiving were rendered before and after dinner by members of St. Paul's Cathedral Choir. A fanfare of trumpeters heralded each of the speakers.

Before the speeches began, Dr. Roxbee Cox, president-elect of the R.Ae.S., read the following messages:—

From Dr Edward P. Warner, president of I.C.A.O. and an Honorary Fellow of the R.Ae.S. and I.Ae.S.:

"Congratulations to the Royal Aeronautical Society and the Institute of the Aeronautical Sciences on so notable a series of meetings. It is another concrete manifestation of the power to co-operate. Deeply regret cannot be with you."

From Mr. Lester Gardner, founder of the Institute of the Aeronautical Sciences and for many years its director:

"Greetings Hope Conference a great success. Regards to all my friends."

From Mr. Griffith Brewer, a past-president of the R.Ae.S.:

"Please express my warmest appreciation to the Conference for their greetings and my deep regret at being unable to be with them on this historic occasion."

Dr. Roxbee Cox added that Mr. Griffith Brewer had been very ill, but that all his friends were delighted to know that he was getting better and would be with them again soon.

There was a very long toast list, and some of the speeches were rather lengthy, but so good were they that certainly no one became bored.

Historic Associations

The toast of The Lord Mayor, Aldermen, Sheriffs and the Corporation of London was proposed by Sir Oliver Simmonds, a vice-president of the R.Ae.S. He expressed appreciation to the Lord Mayor on two counts: first, for his presence, and, secondly, for the unique nature of his edificial hospitality. Through the courtesy of the Lord Mayor they were seated with the memories of 500 years: The making of Kings, the trials of heritage, the triumphant march of the victor. Edward IV, Cranmer, Cromwell, Marlborough, Pitt, Nelson and Wellington were all there. And it was not so long ago that the greatest of all the Fellows of the Royal Aeronautical Society, Mr Winston Churchill, had come to the Guildhall to hurl defiance at our foes and to bid us, on both sides of the Atlantic, be of good cheer and fight through to victory.

Although, Sir Oliver continued, the I.Ae.S. and R.Ae.S. had worked in the closest harmony throughout the years, the present was the first occasion on which they had held a joint meeting. He trusted it would not be long before a second such meeting was held. We in this country had learned to appreciate our American friends more intimately than was possible in the course of the fleeting visits which they had paid to our shores and we to theirs. They were met together as cousins, as very good friends, to testify to a deep sense of common regard and an unswerving unity of purpose, that fuller unity which, with steady crescendo, now animated our two great nations. It was an essential foundation of peace and, if all else failed, the guarantee of our common heritage.

The Lord Mayor of London, Sir Bracewell Smith, in responding to the toast, complained that Sir Oliver had strayed from the path by including in his toast several subjects that were not on the toast list, thus leaving little to which to reply. He would have thought that Sir Oliver would have dwelt on the historic associations of the City of London which, founded as it was 2,300 years ago, had seen many adventures launched. He felt that, in view of the City's history of pioneer work, it was fitting to celebrate the conclusion of the first Anglo-American Conference in the Guildhall. He could not imagine that it could be used for any more useful purpose than for the celebration of the alliance between the R.Ae.S. and the I.Ae.S.

His Excellency the American Ambassador, Mr. Lewis Douglas, proposed the toast of the Royal Aeronautical Society. After passing comment on the present state of the world, he said the present was but a legacy of the past, the events of today were but reflections of that which had gone before. That was no less true of the natural sciences and of the applications of scientific knowledge to our way of life than it was of development in the arts and letters, and in politics, in the way in which human beings behaved under a certain set of circumstances. If we were to understand modern aircraft and the evolution of aerodynamics, we must not be unmindful of the pioneers.

1866—and all that

One of the most notable events in the history of aviation was the establishment, 81 years ago, of the Royal Aeronautical Society. As notable as its establishment had been the fashion in which it had husbanded, cherished and exchanged the knowledge which it and its members had wrung from a stubborn nature throughout the course of four-fifths of a century. As notable was the way in which, true to the tradition of modern science, it had liberally given everything that it had learned. Equally notable was the present occasion, on which, joining with the I.Ae.S. of his own country, it was freely, unrestrainedly, unhampered and unfettered, receiving and giving of the knowledge which members of both bodies had garnered and gathered unto themselves. But more important than that, the meeting of the two bodies was symbolic of the similarity of interests which bound their two countries together. If those engaged in politics could have the same objectives, if they enjoyed the same criteria, they would all be able to view in their proper perspective the minor differences which sometimes appeared to cloud the deep commonality of interests between us. In troubled times tensions appeared. But if we could view superficial tensions in their proper perspective, measure them in the light of the great strain on the world, there could be no doubt about the companionship between the two great nations.

The president of the R.Ae.S., Sir Frederick Handley Page, replied to the toast. He said that, standing in that hall, it seemed to him that we of this country and our brothers across the seas had a common heritage as they saw the monuments to past great men, and the unfortunate results of the attacks by an alien autocracy on our common civilization.

Sir Frederick said that in the conference which was now ending they had worked together on common lines. Over all the discussions on technical matters, whether concerned with helicopters, aerodynamics, materials or anything else, they had been ascertaining facts, seeking to advance our common knowledge. But he rated highest of all the renewal of friendships and the making of many new friends. They had had a marvellous gathering, and it had been a revelation of the immense amount of work they could do together where there were common problems, and occasionally common Governmental obstructions. If the scientists, research workers and engineers of our two countries could continue to get together we could go forward into the future without any fear that anything could possibly divide us.

The Visitors

Lord Greenwood, proposing the toast of the Institute of the Aeronautical Sciences, said its members had received the greatest token of consideration possible from the Lord Mayor in supporting the R.Ae.S. in welcoming them in the Guildhall. He recalled that the I.Ae.S. had between 5,000 and 6,000 members; it was great and it was growing. The R.Ae.S. had about 6,000 members, and it was growing. Together the two represented the brain power in the development of aviation. Our American visitors had come in one of the worst periods in our history. But though we were distracted and worried, our people were determined to carry on, not only in aviation but in all the ordinary business of life. He hoped there would be an annual gathering on one side of the Atlantic or other. Science, like art, knew no frontiers, and there must be the greatest comradeship among those associated with the scientific development of aviation.

Mr. Preston R. Bassett, president of the Institute of the

(*Continued on page* 334)

RADLETT

Mr. W. R. Verdon Smith, M.A., President of the S.B.A.C., welcomes the visitors to the exhibition.

Eighth S.B.A.C. Flying Display and Exhibition : Bigger and Better than Ever : A Fine "Shop Window"

Illustrated by *Flight* Photographs and Sketches.

MAGNIFICENT was the word with which the majority of our visitors from overseas described the show organized by the Society of British Aircraft Constructors at Radlett. And in truth it was a splendid effort on the part of all concerned. The organization was good, the range of products was wider than at any previous S.B.A.C. exhibition, and the quality of workmanship was of a very high order.

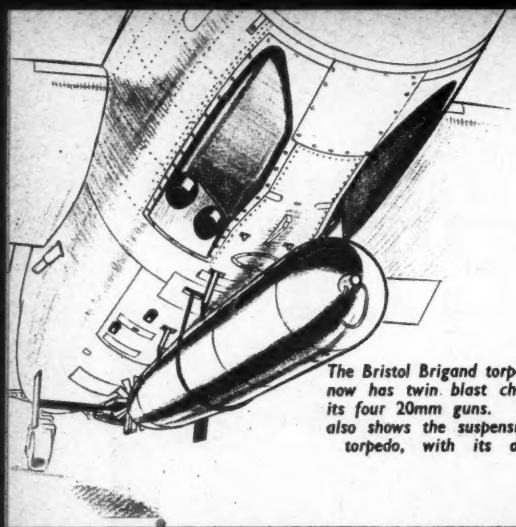
Perhaps the outstanding impression left might be summed up by saying that while there were many pointers to the lines which long-term progress and development are likely to follow, the present and the immediate future were extremely well represented. As Mr. Verdon Smith said in his address of welcome to the guests, "the technical and engineering achievements displayed amply demonstrate the high place which we as a nation claim to occupy in the field of aircraft engineering."

As is his wont, Mr. W. R. Verdon Smith, president of the S.B.A.C., made an excellent opening speech on September 9th. We particularly liked his spirited assurance. This country has lately adopted far too much of the hat-in-hand attitude. There was nothing of that in Mr. Smith's welcome to the visitors. "We take pleasure in finding," he said, "that so many friends, so many critics—and, I hope I may add, so many customers—have accepted our invitation."

Free and fair competition was the lifeblood of aviation, he added, and the visitors had highly critical faculties of observation and discernment. The process of competitive selection by discriminating customers would require no guidance from him. He was confident that all the visitors, coming as they did from some 45 nations, would not be wasting their time.

He went on to express his regret that once more it had been impossible to admit the general public. With the help of Government departments they had explored all possibilities, but no suitable airfield near London could be found. He hoped the time would come when the public, who have so deep an interest in the products of the aircraft industry, could be admitted.

Mr. Verdon Smith regretted that urgent Government business had kept several heads of departments away from the opening. He read a long message from the President of the Board of Trade, Sir Stafford Cripps, who had, while Minister of Aircraft Production during the war, seen the beginnings of many of the products shown, and who still kept in close touch with the aircraft industry, in which he was very much interested. The Minister of Supply, Mr. Wilmot, sent good wishes for the success of the exhibition. Lord Nathan, Minister of Civil Aviation, was not yet back from his trip to Australia, but Mr. Lindgren, his Parliamentary Secretary, attended the opening.



The Bristol Brigand torpedo fighter now has twin blast channels for its four 20mm guns. This view also shows the suspension of the torpedo, with its air tail.

Radlett . . . . .

Among the visitors specially mentioned by Mr. Verdon Smith was His Royal Highness the Regent of Iraq and Major-General Prince Firuz, who is Inspector-General of the Imperial Iranian Air Force.

A special welcome was extended to our American visitors, many of whom had come over in connection with the Anglo-American Aeronautical Conference. That had brought to this country a veritable galaxy ("dare I say Constellation," Mr. Verdon Smith added) of aeronautical talent. He especially welcomed the president of the Institute of the Aeronautical Sciences, Mr. Preston R. Bassett, and such old friends as Ted Wright and Grover Loening. He took the presence of so many of our good American friends as a fine compliment. Evidently America believed—as we believe—that there was a good deal to be learned from first-hand study of the British aircraft industry.

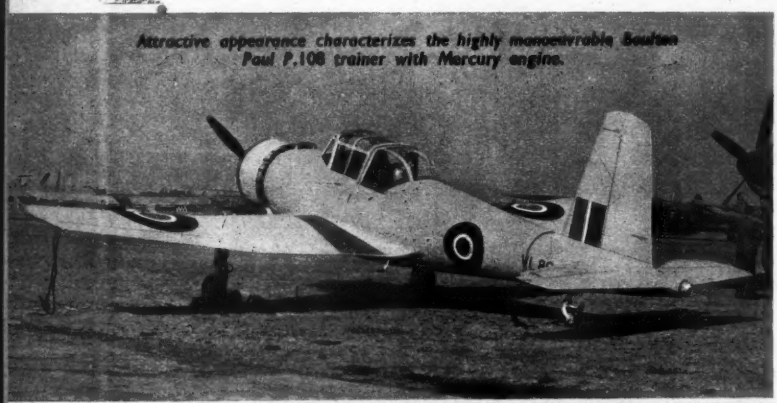
After thanking Handley Page, Ltd., and Sir Frederick Handley Page personally for putting Radlett at the disposal of the S.B.A.C., Mr. Verdon Smith extended special thanks to the Minister of Supply, and particularly to Sir Alec Coryton, Controller of Supplies (Air), without whose helpful collaboration many of the most interesting exhibits would not have been shown. Mr. Verdon Smith also had a word of thanks for the technical Press, which by dealing so fully with the exhibition, had made much information available to those who were not able to visit the exhibition.

Turning to the aircraft exhibits, Mr. Verdon Smith said this field was at one of its most interesting stages. The pressure of wartime demands having disappeared, all concerned with determining requirements or with offering solutions, were pausing to think. Evidence of probable trends was to be found in many of the exhibits, and more was to come. He also referred to the tribute paid to British genius by securing licences to build our products abroad.

In civil aviation great progress had been made and, looking ahead, we had every confidence in the merits of our new designs.

Mr. Verdon Smith pointed out that although the flying part of the programme was the most spectacular, the Society had associate members whose products were well worth a close study in the static exhibition. In conclusion, he re-

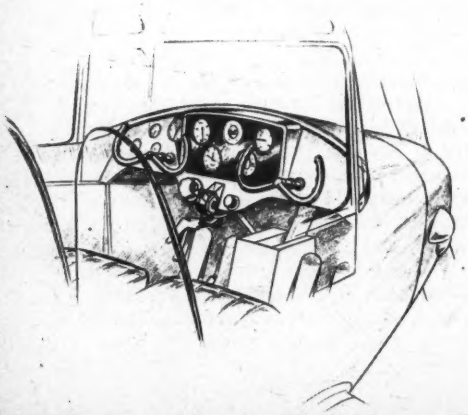
Attractive appearance characterizes the highly manoeuvrable Boulton Paul P.108 trainer with Mercury engine.

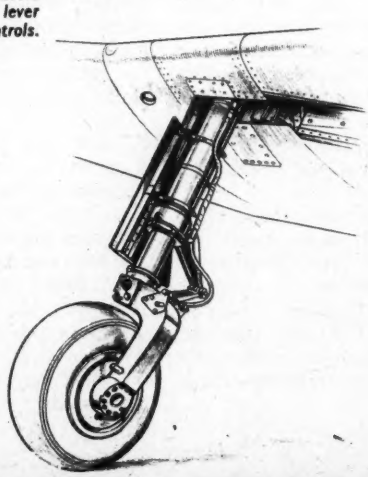


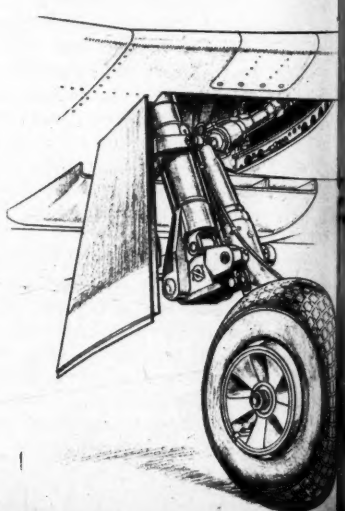
Designed to take the shock of heavy deck landings—a main undercarriage assembly of the Westland Wyvern. Note that the wheel-well is covered when the wheel is down.

Simplicity and sturdiness characterize the undercarriage of the Boulton Paul P.108 trainer, Mercury-engined prototype of the Balliol.

This drawing of the Newbury Eon cockpit shows the simple and clean layout. Flap and elevator trim levers are on the floor between the seats and the brake lever can be seen below the throttle and mixture controls.







ferred to the fact that the Government was en couraging industry to export. The aircraft industry needed no such encouragement. It was going all-out for business. As an instance he quoted the establish ment of S.B.A.C. offices overseas; who kept in very close touch with customers, and it was hoped very soon to provide repair and maintenance facilities in a number of places.

Having been closely in touch with the various manufacturers for some weeks past, and knowing how they have exerted themselves to have proto types "ready for Radlett" it was particularly gratifying to see so many new designs among the military and civil aircraft displayed. That the Hawker N. 7/46 naval jet fighter could not be present because of an official ban was, of course, a keen dis appointment, particularly to Mr. Camm and his team. The omission of the Saunders Roe S.R./A1 jet flying-boat fighter from the flying programme was another reason for acute regret. A minor fuel feed problem was responsible.

Though not all able, or permitted, to take part in the flying demonstration, the following new military types were represented: the Westland Wyvern naval strike fighter and Blackburn S 28/43 torpedo dive-bomber aircraft, the Prestwick and Heston A.O.P. monoplanes, the Mercury-engined Boulton Paul P.108 trainer prototype and the Vickers Valetta medium transport. Civil newcomers were the Airspeed Ambassador, Handley Page Hermes II, Avro Tudor VII, Short Solent, Miles Merchantman and M.68, Percival Merganser, Cunliffe-Owen Concordia, Ports mouth Aerocar, Newbury Eon, and Auster Avis.

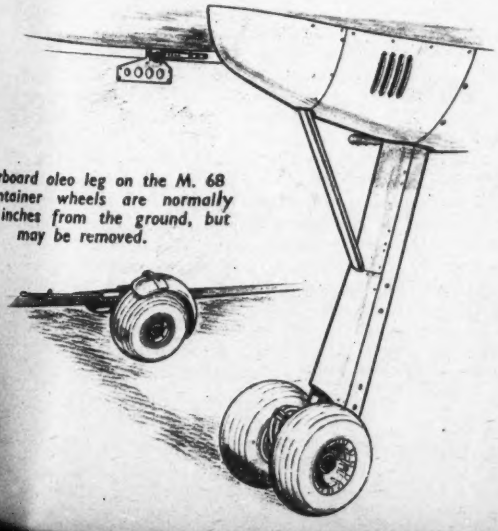
Membership of the "rotary club" this year included the Fairey Gyrodyne in addition to the Cierva W9. Gliders were more in evidence than usual (a healthy sign) and the Fairey Stooge had the dis tinction of being the first—and only—guided missile to be exhibited.

Among the engine manufacturers Rolls-Royce, Napiers and Alvis had novel, if not precisely new, exhibits. Rolls-Royce showed, for the first time, a part-sectioned Nene gas-turbine, whilst Napiers had on view a nicely painted and polished Naiad 1,500 h.p. airscrew-turbine, this being the "water nymph's" public debut. Alvis exhibited a helicopter power-plant version of the Leonides which appeared to be an extremely neat unit and, moreover, one which would seem to permit easy installation.

Inevitably, one finds oneself remembering last year's "Radlett" and making comparisons. Was this year's a better show than last? Yes, unquestionably it was. It was more complete. There were virtually no gaps and our whole aviation effort was embraced. Objectively, it was a better show than 1946's. Sub jectively, it was not: but only because last year was a renaissance after too many lost years and the con-

The Centaurus-engined Hawker Fury stands proud midst the diversity of loads (including depth charges!) it is able to carry.

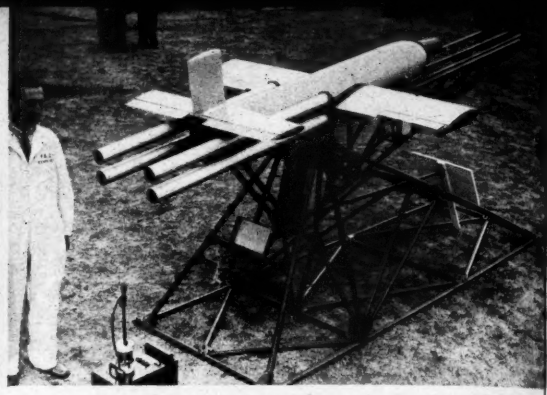
The three General Aircraft research gliders: top, the "U," centre, the "maximum V," and below, the "medium V."



starboard oleo leg on the M. 68 container wheels are normally ral inches from the ground, but may be removed.

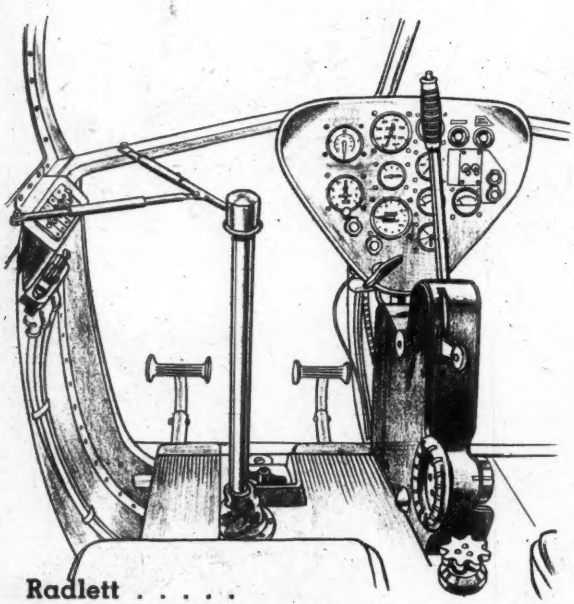
Looking smart in silver and yellow, the Fairey Operational Trainer gave a smooth aerobatic demonstration.

Shown in public for the first time, the Fairey Gyrodyne is workmanlike and incorporates several novel features.



The Fairey Stooge guided missile was displayed with its launching ramp, booster rockets and control gear.

The Fairey Gyrodyne cockpit, showing the instrument panel and controls. The control column is in the locked position.



Radlett . . . . .

trast was enormous. This year there was no contrast to lend sharpness to the view. But the static exhibition, as indeed can be said of the whole, was a magnificent example of our recovery—and recovery it is in spite of our current economic plight.

Military Aircraft

There was no new or developed type among the specialized fighters to allay entirely the disappointment occasioned by the absence of the Hawker N.7/46. The Attacker, Meteor and Vampire, with their traditionally astounding displays, were, however, amply consoling, especially when one reminded oneself that each in its class is still unexcelled.

Briefly, the facts concerning the Hawker "N.7," insofar as they can be reported within the terms of Defence Regulations, are these: By Monday the prototype had done about thirty minutes' flying and had been transferred from Boscombe Down to Farnborough. Mr. Humble takes kindly to it, remarking particularly on its quietness which, one believes, can be attributed to the beautifully made cockpit enclosure, with its faired windscreen. At 300 knots it is said to be barely audible. With so little experience on the type (though he has flown the Vampire and Meteor for a short time) Humble, quite understandably, would not have felt entirely justified in bringing the new prototype into Radlett. It is valuable enough in its own right and carries some tens of thousands of pounds worth of test equipment. The model on the Hawker stand showed it to have a wing without sweepback, wing root intakes for the Nene, twin outlets aft of the trailing edge, and a cockpit in the extreme nose of the fuselage, which has a beautifully sweeping bottom line.

Glosters conservatively claim only 585 m.p.h. for the fully equipped, short-span Meteor IV, though it is said to be good for 605 m.p.h. under ideal conditions. They showed a large-scale model of the Meteor IV with the new lengthened nose. This modification eliminates several hundred pounds of ballast hitherto carried and the extra 30 inches allows space for another fuel tank, holding 100-120 gallons. The Martin Baker ejector seat is fitted in this latest version and the model showed the machine carrying a 180-gall ventral tank and two 100-gall. wing tanks.

Fighter Qualities

Supermarines continue to quote 590 m.p.h. for the Attacker and from the new Hawker a speed of over 600 m.p.h. is expected. Apart from level speed, however, a multiplicity of qualities—some scarcely tangible—go into the make-up of a thoroughbred fighter, and these, to an unsurpassed degree, are possessed by the British machines. This is one reason why the Vampire, whilst appreciably slower than our other jet fighters, continues to gain in popularity. The wording "desert equipment" on panels in the fuselage of the Meteor demonstrated so convincingly by S/L. Waterton served to remind visitors of the exacting specifications to which our fighters are designed.

The Attacker, flown by Lt. Cmdr. Lithgow, was the original prototype TS409, without deck-landing hook, looking somewhat less spruce than last year after some gruelling development flying, but now uninhibited in the matter of aerobatics (particularly since the spring-tabs were fitted). Further development of the Attacker will probably concern wing, rather than fuselage, design.

Somewhat illogically, it seemed, though there was doubtless some good explanation, the latest Mark III Vampire, with the redesigned tail, was confined to the static display, while the Vampire demonstration was handled by a Mark I, exquisite in its high-glaze, blue porcelain-like finish.

Among the airscrew-driven fighters the Hawker Sea Fury X, Bill Humble up, is always a sure-fire attraction. It was hardly to be expected that Humble would produce any new aerobatic trick "out of the hat," but his display was as masterly as ever. The Hawker Company, while admitting that the airscrew-driven fighter is becoming outmoded for pure interception duties by the turbo-jet fighter, justly claims that it still offers unquestionable advantages for certain strategic and tactical roles. Another point they make is that for ground-attack work the air-cooled engine has a great advantage over the liquid-cooled, probably being able to return to its base after receiving a number of hits. The company is no longer able to offer the Fury equipped with Napier Sabre VII, as this particular mark of Sabre is out of production. Nevertheless, the prototype

Sabre-Fury I, striking in its new finish, was displayed.

The Sea Fury X demonstrated was quite standard, as was the Supermarine Seafire 47, with its contra-rotating airscrew.

Flown with great finesse by Mr. Derry, the Seafire spent a large proportion of its allotted time inverted. Another type which sported a contra-prop this year (though this is not a standard fitting, as in the case of the Seafire 47) was the Fairey Firefly IV fighter reconnaissance two-seater, ably presented by Mr. Peter Twiss. Without doubt the duplex airscrew is an advantage on carrier-borne aircraft, but it remains an expensive item and its standardisation in these days is not lightly to be undertaken. The twin-Merlin Sea Hornet XX naval fighter, as shown in the static aircraft park, is, of course, fitted with "handed" airscrews. Many regretted that de Havilland could not allot any of their display time to this outstanding machine.

Though the might of the R.A.F. has so largely been founded on heavy bombers, only the Lincoln was present to perpetuate a great tradition. A perfectly standard aircraft wearing Service camouflage, it was, as such, respectfully admired. The bomb bay yawned for a ten-ton load, and its capacity could best be gauged when the machine was flown over very low prior to pulling up in a quite astonishingly steep and protracted zoom. Next year, no doubt, Avro will present the Shackleton, a heavier machine than the Lincoln, already ordered in quantity for Coastal Command. The Shackleton is powered by four Rolls-Royce Griffons, driving contra-rotating airscrews.

Strike Aircraft

Carrier and shore-based strike aircraft were well exemplified. Though the Westland Wyvern was placarded as a Naval fighter it is, in fact, best described as a strike fighter, or by its official designation, torpedo fighter. It can, moreover, be employed on intruder operations. As a matter of interest the Wyvern demonstrated so convincingly by Mr. Garner was prototype No. 2. The first machine, one learned, has just been painted in the new-style Naval camouflage (grey-blue gloss) as shown on models of the Wyvern in the static exhibition. The third aircraft will be fitted with its arrester hook and the wings will be foldable, as on all subsequent Wyverns. The Wyvern looks aggressive and massive. Someone described it as "a real slugger." That the ability to hand out punishment—in the form of a 21-inch torpedo, Uncle Tom rockets, or lesser but equally offensive missiles—is not incompatible with fighter speed and manœuvrability was unequivocably established by Mr. Garner.

Unlike the Wyvern, the Blackburn S.28/43, designed for torpedo attacks and dive bombing, "toted a tin fish" on its Blackburn torpedo carrier. Mr. Flood refrained from advanced aerobatics but showed the excellent lateral control of this new type—a particularly desirable quality in a torpedo aircraft to enable it to take avoiding action. Those who had not previously seen the "S.28," or Firecrest as it is unofficially known, in the air, were astonished by the speed with which the undercarriage retracts and extends. The time required seems to be between one and two seconds.

A standard Firebrand V, complete with torpedo and auxiliary tanks, was available for detailed inspection. This is shown in a photograph on another page.

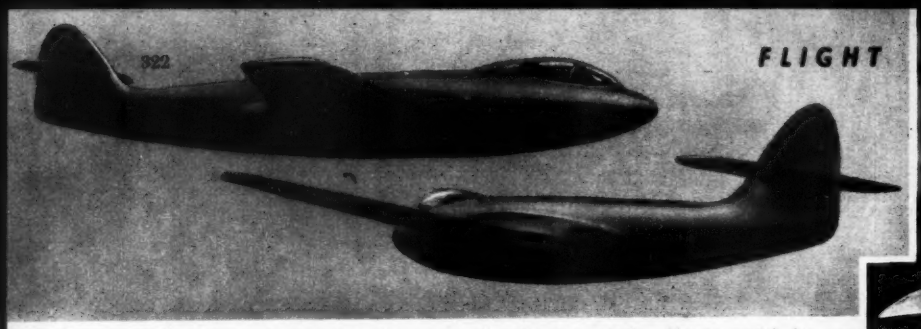
Representing the heavier twin-engined land-based strike fighter class, the Bristol Brigand T.F.I. appeared in its Coastal Command colour scheme, that is, white with grey upper surfaces (except, for some unexplained reason, the top of the fuselage). With a red, silver and blue torpedo and eight black, yellow and red R.P.s it might fittingly have changed names with its illustrious forebear the "Beau." A modification to the front gun installation

Lt. Cdr. Lithgow brings the Attacker across the airfield at nearly 600 m.p.h.

With flaps out the Wyvern gets away, flown by Mr. Garner.

The Seafire 47 naval fighter in a characteristic attitude. Mr. Derry displayed this type in a highly individual manner.

From this viewpoint (right) the contra-rotating airscrew of the Firefly IV is easily seen. Mr. Twiss is the pilot.



Twin intakes and twin outlets characterise the Hawker N.7/46 (one R.-R. Nene)

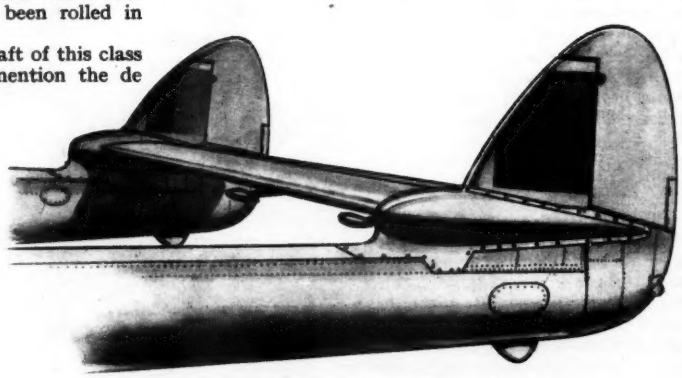
Not just another Meteor model, but one showing the new long nose and external tanks.

Radlett . . .

was noticed: whereas originally the four Hispanos fired through ports well forward in the fuselage, there are now two large concave blast channels extending some distance aft. The machine displayed was also fitted with the latest clear-vision cockpit enclosure. Mr. Gibbs put up a really outstanding flying display on the Brigand. Not only did he demonstrate its ability to turn tightly, but he delighted everyone by executing a roll. This is probably the first time an aircraft carrying the war load already mentioned has been rolled in public.

While discussing aircraft of this class it is not unfitting to mention the de Havilland Mosquito prototype, shown for the second year in succession. Itself a day bomber, this historic machine was displayed with items of military equipment which the "Mossie" has been developed to carry in its variegated forms. Among these were two 1,000 lb. rockets.

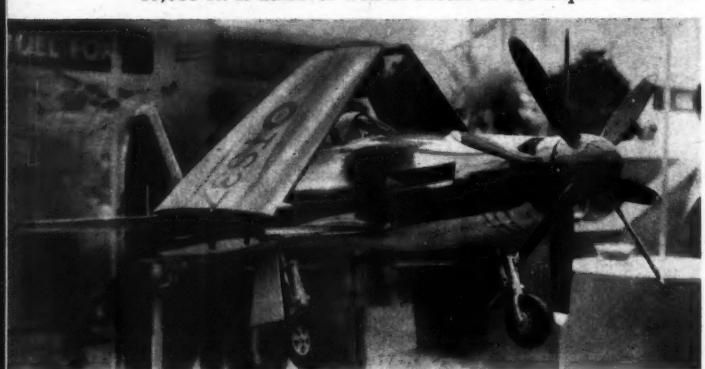
Due to its relatively large size (it has a span of about 60 ft., though the folded width is only 20 ft.) the Short Sturgeon did not, perhaps, convey a true impression of its speed. At 19,000 ft. it achieves well in excess of 400 m.p.h. Some of Mr. Booth's manœuvres in the Sturgeon produced pronounced wing-tip trails, and his upward rolls suggested that whoever was responsible for the specification might well have included fighting in the list of the Sturgeon's duties. The reconnaissance version, as demonstrated, is not in quantity production, but the Mark II target tower will be supplied to the Royal Navy next year.



The new tail unit which characterises the de Havilland Vampire III.

Painted to match the civil Hermes II, the Handley Page Hastings impressed not only by its bulk and cleanness of design, but by its remarkably high speed. Together with the Lincoln it represented Service aircraft in the "circus" of multi-engined types which opened the flying programme on Tuesday and Wednesday. To see an aircraft designed to carry 25-pounder guns or three-ton lorries, zooming steeply to over 1,500 ft. is undeniably an entertaining experience, and we would not agree with those who maintain that in view of the role of the Hastings such flying proves nothing. One gathers that a dihedral tailplane is to be fitted experimentally to one Hastings.

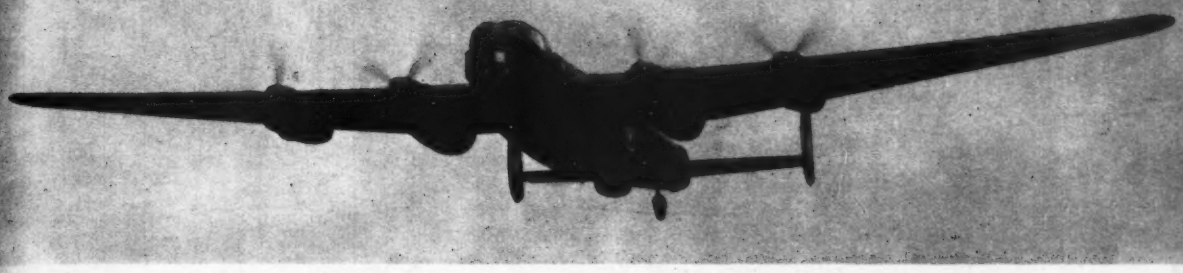
Together with the Hastings the Valetta, likewise displayed, will shortly be in R.A.F. Service. Particulars were published in *Flight* of September 4 and a new flying photograph appears in this issue. Visitors to the Valetta—and there were many—noted the transparent panel in one of the loading doors, giving access to fire extinguishers and an axe. These items, of course, are also accessible from inside the aircraft. The fourteen windows are all designed as pull-in emergency hatches. With its inherent safety and such features as those mentioned the Valetta should soon become popular with the Army.



The Sea Fury X with wings folded, contrasted with a model of the Wyvern (top). Folding wings will be fitted on the third Wyvern prototype.

Air Observation Posts

Last year, it will be remembered, a great deal of interest was occasioned by a model of the Heston A.O.P. monoplane to specification A.2/45. This year the prototype was demonstrated in the air, although only a few flying hours have yet been completed. Not even the Heston Aircraft Company design staff would claim that this stilty pusher has beauty, but it does possess other virtues in abundance, notably the ability to take off and land in very confined spaces and to fly slowly; an exceptionally wide field of view; ease of maintenance; and ease of transport. The full-span leading-edge slats and the large slotted flaps form a high-lift system which is considered to be near the optimum for the wing in the take-off case. Higher lift coefficients than those obtained would result in a higher induced drag.

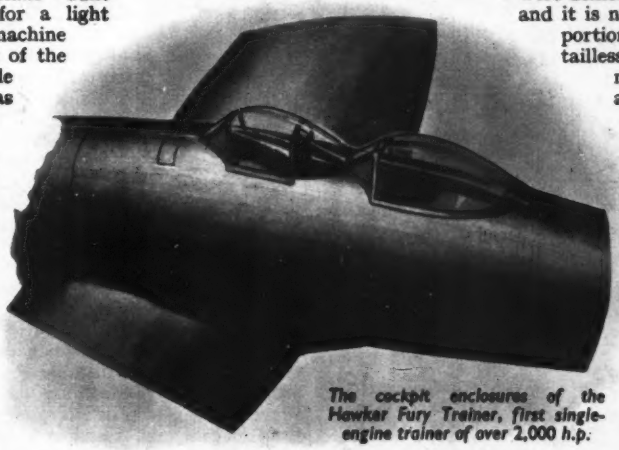


With bomb doors open, the Avro Lincoln heavy bomber is seen at the bottom of a dive before pulling away in a steep zoom.

sufficient to increase the total length of the take off (including climb over a barrier).

The Heston machine is of later conception than the Auster A.O.P. series, the latest development in which—the Mark VI—demonstrated its own remarkable qualities. The salient features of this type are reproduced in the new four-seater Avis for civilian use. Details of the Avis are given elsewhere.

The high-wing tractor formula has been adopted for the Scottish Aviation monoplane built to meet a requirement for a light military transport. This machine is the Service counterpart of the civil Pioneer. It was unable to fly at Radlett but was rarely without its circle of curious visitors. With slots and flaps extended the effective wing area is astonishingly large. Of particular interest are the Fowler flaps which themselves embody split flaps. With its all-metal construction, 100-yard take-off run, 50-yard landing run and 500-mile range, this new type should prove suitable for numerous military duties.



The cockpit enclosures of the Hawker Fury Trainer, first single-engine trainer of over 2,000 h.p.

Static or airborne, the Boulton Paul P.108 trainer prototype, with Bristol Mercury engine, came in for its full share of praise. In the hands of Mr. Lindsay-Neale, it was shown to have the true "fighter-like" manœuvrability so often claimed for trainers, but not always substantiated. The pilot, however, caused some perturbation as he mushed towards the ground in pulling out low from a steep dive. A cockpit section displayed in the "Static" hangar was that of the turbine-engined version. Its Avro counterpart—the Athena—was shown as a model. Details of the Merlin-powered Athena appear on another page.

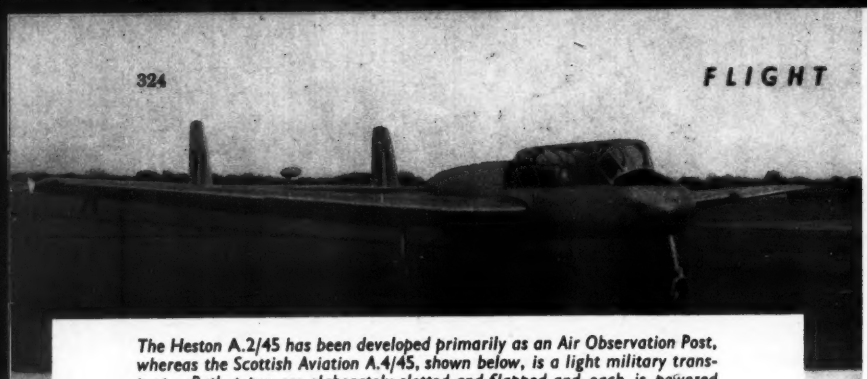
With the Armstrong-Siddeley Mamba or Rolls-Royce Dart Airscrew turbine the Athena is designated Mark I. The Merlin version is the Mark II.

Mr. Carruthers, in the Percival Prentice, was badly handicapped on Tuesday by a temporary lack of power. A long delay at the end of the runway caused the plugs of his Gipsy Queen to oil-up. No such ill-fortune beset the Reid and Sigrist Desford, the flying characteristics of which have won the highest praise. Too little is seen of this delightful little "twin." The Canadian-built D.H. Chipmunk put up the performance for which it has become famed in recent months and the Fairey Operational (and tactical) Trainer showed—as at Lympne—that it is faster than originally claimed. Parked for examination were the twin-Centaurus Buckmaster and the dainty Spitfire Trainer.

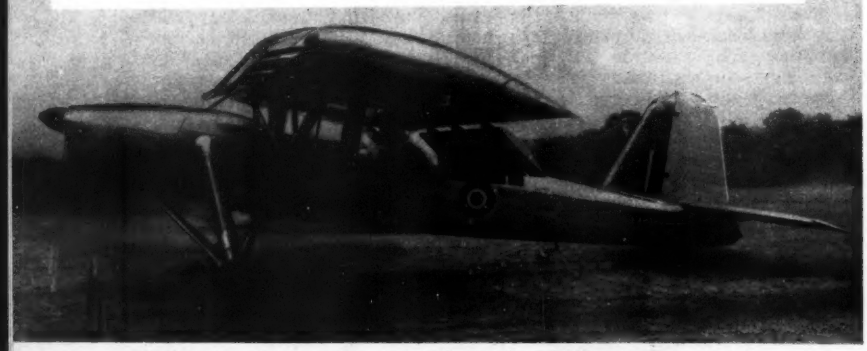
Several of the research aircraft, both powered and towed, were demonstrated in the air this year, and it is noteworthy that a high proportion of those exhibited were tailless; however, there was little new information to be gained about them. The three General Aircraft "manx" gliders with U and V wing form, illustrated on page 319 have been flown extensively behind a Spitfire. The outstanding tailless D.H. 108, number 3 of its type, differs from that seen last year in shape of nose and cockpit enclosure. It has the high-rated Goblin III (3,300 lb. thrust). A fine air study appears on page 331. It was a great disappointment that the very advanced twin-Nene flying wing A.W.52 could not be made ready for exhibition due to the need for redesign of its intricate hydraulic system. A model was shown in its place.

Mr. Gibbs shows how the Bristol Brigand can turn with full war load. He rolled this heavy machine beautifully.

The Short Sturgeon (far right) flown by Mr. John Booth, was another comparatively large machine which was rolled.

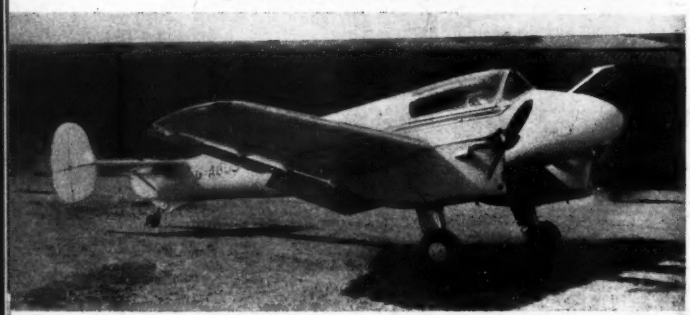


The Heston A.2/45 has been developed primarily as an Air Observation Post, whereas the Scottish Aviation A.4/45, shown below, is a light military transport. Both types are elaborately slotted and flapped and each is powered with a single de Havilland Gipsy Queen.



Another view of the greatly admired Boulton Paul P.108 three-seater advanced trainer (below). This Mercury-engine prototype precedes the turbine-powered Balliol.

Exceptionally fine flying qualities are a characteristic of the Reid and Sigrist Desford (below), powered by two Gipsy Majors.



The main features of the Auster A.O.P. Mark VI (below) are reproduced in the new four-seater Avis for the civil market.

An undercarriage sembly and the intake on the He A.O.P. monoplane. sturdy undercarr is, of course, a p necessity on an airc of this class.

Radlett . . .

It should not now be long before the Avro Tudor VIII makes its first flight. This is, of course, the modified and lengthened Tudor I with two pairs of Rolls-Royce Nene pure jet units. A handsome model was exhibited on the A. V. Roe stand. This research aircraft should, without payload, be capable of flying exceptionally high and of crossing the North or South Atlantic oceans. Another civil jet application, shown in model form, was the two-Nene Viking.

Intended purely for engine development, the Theseus-Lincoln appeared and flew at Radlett for the first time. Great consequence attaches to this aircraft and its Bristol airscrew turbines from which valuable data for later highly important Proteus installations is being gained. The country is entirely dependent upon the rapid and successful development of Proteus airscrew turbines to power our two largest civil transports now under construction, the S.R.45 and Bristol 167.

Another newcomer in the engine-flying-test-bed class was the Ghost-Lancastrian which, in conjunction with the D.H. 108, is to provide advance data for the development of the D.H. 106 high-speed transport. This was the Ghost's flying debut at Radlett.

News of the release and flight of the first Vickers supersonic model is now awaited weekly after an unfortunate delay following a mishap and loss of the first example before its launching. The models have been designed by the company's Weybridge research department. The "model of the model" displayed at Radlett is painted yellow on top and black below, possibly to aid in tracing progress after release at altitude from the Mosquito carrier.

The only helicopter to fly was the familiar Cierva W. 9, which is still in use for research into drive transmission and rotor blade design.

Civil Aircraft

Manufacturers can be relied upon to spring surprises at the S.B.A.C. shows, and somehow during the preceding months they maintain a partial secrecy concerning modifications, changed performances and even about new products. This year's show was certainly no exception in the civil aircraft categories, and there were a dozen types which were new to Radlett, and many interesting developments of earlier designs.

Progress made during the past twelve months is encouraging, and if the models of projects seen on the manufacturers' stands in the static exhibition are any indication, we may expect an even more interesting show next year. Naturally the newcomers attracted most attention, but it would be wrong to assume that those to which we have already

The Bristol Theseus airscrew turbines outboard of the Merlins were clearly visible on the Theseus - Lincoln, flown by Mr. Northway.

become accustomed were anything but interesting, and it was gratifying to hear from the various manufacturers how well production is progressing.

All exhibits in the heavy airliner class were newcomers. The Tudor VII with the Hercules engines is probably the heaviest aircraft yet built in this country; it was being shown to the public for the first time and made an impressive spectacle in flight. The interior furnishing was according to B.O.A.C. specifications.

The Hermes II exhibited on its home ground just qualified for exhibition and demonstration by completing more than ten hours' flying by the eve of the show. It was easy to visualise how greatly improved the Marks IV and V will appear with nosewheel undercarriage, and it is to be hoped that the IV's will in fact be flying on B.O.A.C. routes towards the end of next year. Mr. Hazleden flew the Hermes II during the demonstration and finished off with an impressive climb-away.

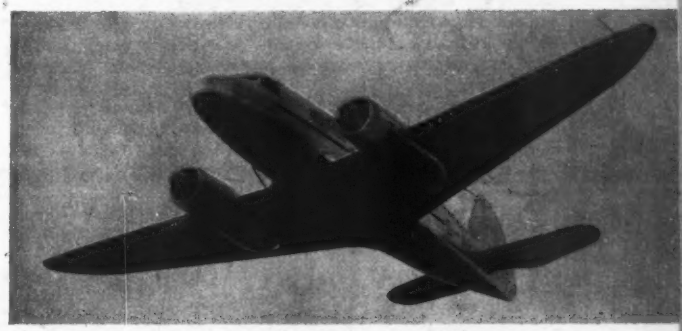
Another item of interest in the Hermes II was the engineer's neat but comprehensive panel. In fact, the entire crew's quarters and the cockpit have been designed for comfort and efficiency.

The Ambassador showed up to great advantage amongst the aircraft with tail-wheel undercarriages. It would be an exaggeration to say that this aircraft stole the civil show, but it undoubtedly created an excellent impression on the ground and also in the air. Mr. Errington attempted no sensational flying, but his audience were made to appreciate the quiet efficiency of this medium-size and very beautiful transport.

There were six Miles exhibits, the largest of which was, of course, the Marathon. The actual aircraft on view was the first prototype with the centre fin, and was, in fact, the same aircraft as that exhibited last year. It had been furnished for an overseas tour, and the company considered it better to show that model furnished than the No. 2 prototype as a shell. A newcomer to the Miles stable was the M.68, which has already been described in *Flight*. Mr. Kendall landed the M.68 near the spectators, a crew dismantled and towed away the removable container, the fuselage tailpiece was replaced and 40 or so seconds after the time the aircraft had stopped it was airborne again. This smartly executed demonstration was well received. It is, undoubtedly, an interesting experiment by Miles, but one feels that its success cannot be fully demonstrated merely by the speed with which the operation can be completed. The Aerovan, Messenger and Gemini were similar to the models shown last year, and all three illustrate the ability of the company to build aircraft which are useful and pleasing to look at. It is

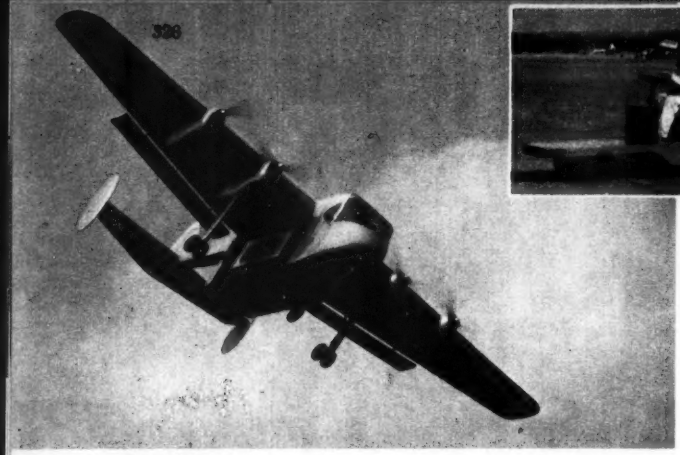
Paired Rolls-Royce Nenes will power the Avro Tudor VIII. A cruising speed of well over 300 m.p.h. should be attained.

The handsomely finished Vickers Viking demonstrator seeks its alloted place in the aircraft park.



Mr. Corbin passes by in the Cunliffe-Owen Concordia, which should soon receive its C. of A.

The elegant Airspeed Ambassador (Mr. Errington, pilot) takes off for a demonstration in the best of good taste. Below is the Tudor VII, flown by Mr. Orrell.



The removable container can easily be identified on the Miles M.68 as it flies overhead. In the inset the trailer is being towed away.

Radlett . . .

also very noticeable that the pilot on a Miles aircraft always has an excellent view.

The Merchantman was seen for the first time this year, and although only in naked fuselage form we understand the company have plans for providing seating accommodation for twenty passengers. The Merchantman was demonstrated by Mr. Ken Waller.

During the flying display, the B.O.A.C. Solent flying-boat *Scapa* flew across and demonstrated its ability to fly and be controlled with ease with two airscrews on one side feathered. The pilot, who is to be complimented, showed off its proportions, manœuvrability and slow-flying qualities. One felt that the visitors were missing so much in being unable to see the interior furnishings and the spaciousness in these Short flying-boats. The turns into and away from the dead engines at low speed and altitude were very pleasing.

The Bristol Freighter has been turned out this year with a number of modifications. The wing span has been increased by 10 feet to 108 feet, and wing tips have been

A model of the Hermes IV which, except that it will have a nose-wheel undercarriage, will resemble the Hermes II, demonstrated at the show.

rounded. Fitting of an automatic pilot and dual controls has been made standard and the fuel capacity has been increased by 100 gallons. These modifications have improved the take-off run and single-engine performance, and several miles an hour have been added to the maximum and cruising speeds. The exhaust pipes have also been re-designed to be swept upwards and over the leading edge of the main plane, so reducing cabin noise.

The Concordia, appearing for the first time, is in a class for which there is considerable demand in this country and overseas. The second prototype was at Radlett and furnished to seat ten passengers in absolute comfort. The large windows are a noticeable feature and the pilot also has a good forward view. A Sperry automatic pilot is fitted as standard equipment. In the same class was the Percival Merganser which also made its initial appearance in public. This may be considered as the prototype for the Prince, which will have a better single-engine performance, a higher ceiling and an improved rate of climb. It will be more

In this flying photograph of the Freighter the new extended and rounded wing tips and the exhaust pipes over the leading edge may be seen.

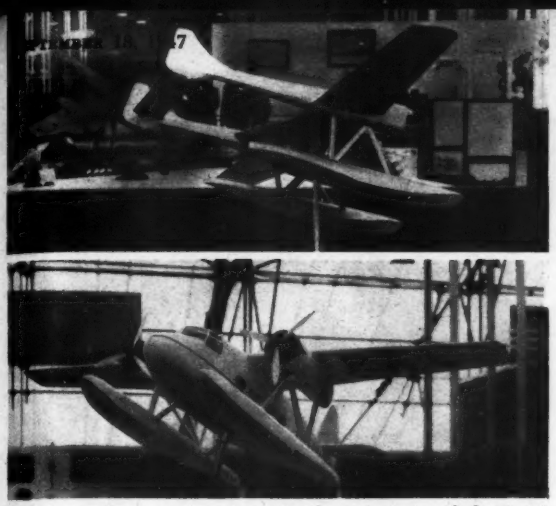
economical to operate than the Merganser and will comply with I.C.A.O. requirements when flying with a full load. It is understood that components for ten are in production.

The Dove was exhibited in two forms: one for normal passenger seating and the other, which is described as an "executive" aircraft, has four facing seats and folding tables. The toilet arrangements just inside the door are extremely neat. Undoubtedly the Dove is well equipped with radio and navigational aids. Airspeeds had on the ground a pair of smart Consuls, one as a normal four-seater and the other convertible for ambulance and other special duties, was fitted with a door measuring 5 ft. by 3 ft.

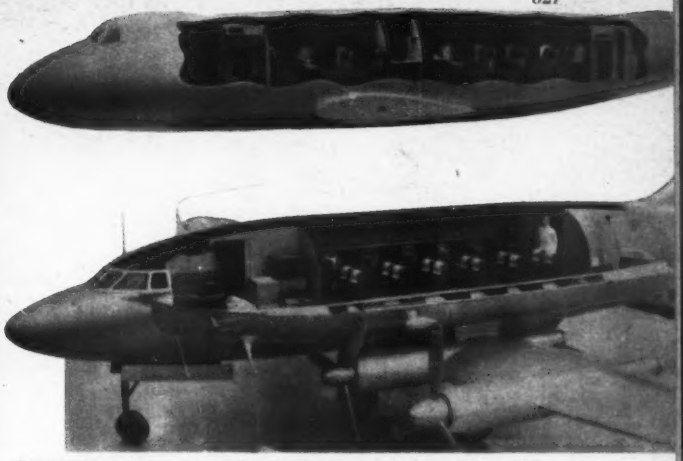
The Portsmouth Aerocar was shown in its composite form and when flown by Mr. Jones put on a good turn of speed. One has the impression, however, that for various reasons it might be more suitable as a freighter than for carrying passengers.

The prototype Newbury Eon was a colourful addition to

Three demonstrations by civil transports. On the left the Short Solent flying steadily across the airfield on all four engines. In the centre the Dove can be seen at speed after a shallow dive. On the right, the Hermes II is impressive as it turns to port.



Several manufacturers showed models of standard aircraft fitted with floats. At the top is the Portsmouth Aerocar and below the Percival Prince.



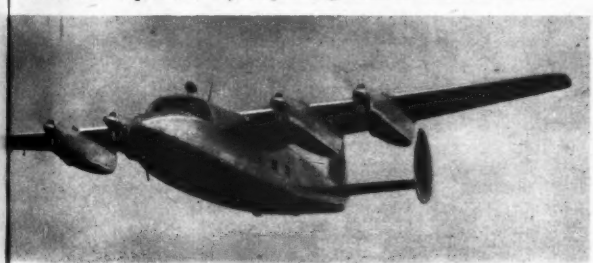
Two models which were studiously compared. At the top the Vickers Viscount and below the A. W. Apollo. Both types are to be turbine-powered, though the Apollo will first fly with piston engines.

this year's show, and although quite conventional in design, it will undoubtedly make an appeal to private owners. It is to be marketed at a reasonable price, and will be produced in wood, but the company are considering an all-metal version for overseas markets. The prototype flew for the first time on August 8th, and a C. of A. was granted within a month.

The appearance of the first Auster Avis was a surprise. This type attracted much attention. It is a direct development of the A.O.P., but provides ample accommodation for a pilot and three passengers. Four large doors give easy entry, and equipment includes two-way V.H.F., cabin heating and lighting. The range is 500 miles, cruising speed 100 m.p.h. and, as with other Austers, the stalling speed is low.

In civil form for the first time, the Sea Otter was alone in its category to fulfil certain special requirements. The inside is more roomy than one would expect.

Looking to transports of the future, one could find every excuse for optimism by inspecting some of the models in the



The first prototype, Miles Marathon flew past on four (as shown) three and two Gipsy Queens. All production aircraft will have only two fins and rudders. The example flown was furnished for an overseas tour.

static exhibition. There was the Nene-Viking and, also on the Vickers stand, there were two models of the Viscount with very noticeable dihedral on the tailplane.

The Armstrong Whitworth stand exhibited a model of the Apollo, which showed the fine lines and high tailplane of this turbine-airscrew project, and it is interesting to note that the company are considering a Mark II powered by Pratt and Whitney Twin Wasp engines.

There was some disappointment that the rumoured demonstration flight of the new Sealand did not materialise. Shorts, however, had a full-size mock-up on the stand, which showed to advantage the seating arrangements on this small amphibian. It is understood that great interest has been shown by the Scandinavian countries, and, in fact, orders have been received for seven aircraft, four of which are to be used on feeder-services to remote towns in Norway.

On the General Aircraft stand there were two models of the Universal, one showing the full seating accommodation for 90 passengers, and the other containing a harvester and tractor. This is a very promising transport.

Judging by the model, the Essex Sprite will be an attractive two-seater, and the Planet Satellite, which should be in the air next month, is unusual. Its development will be interesting to follow.

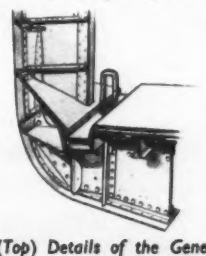
Gliders and Sailplanes

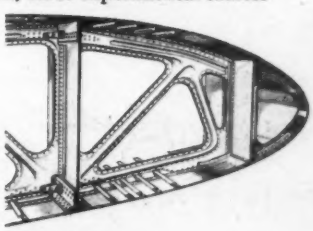
In comparison with last year's show, when only one firm, Slingsby Ltd., exhibited gliders, there were this year five manufacturers with gliders and sailplanes on view. Elliots of Newbury were displaying two prototypes, the Primary Eon,

The Miles Merchantman, flown by Ken Waller, had the new tail unit, with dorsal fin. There will be a passenger version seating twenty in five rows of four.

designed for ground slides, short hops and circuits, and the Baby Eon, an English version of the German Grunau Baby, an intermediate trainer. These two new sailplanes, added to the production of the Elliot high-performance Olympia, make up a range of sailplanes which covers every phase of glider flying training.

Martin Hearn Ltd., distributors for Slingsby Sailplanes Ltd., presented their Kirby Kite II, the side-by-side seater T21B, the Tutor and the Kirby Gull IV, while Short Bros. were showing the gull-wing high-performance Nimbus. Besides the purely 'club' models, three experimental tailless





(Top) Details of the General Aircraft Universal transport aircraft. On the left, the fuselage frame construction, and on the right, the leading edge in which the arrangements for thermal de-icing are evident. (Right) The water rudder as fitted to the Proctor VI floats.

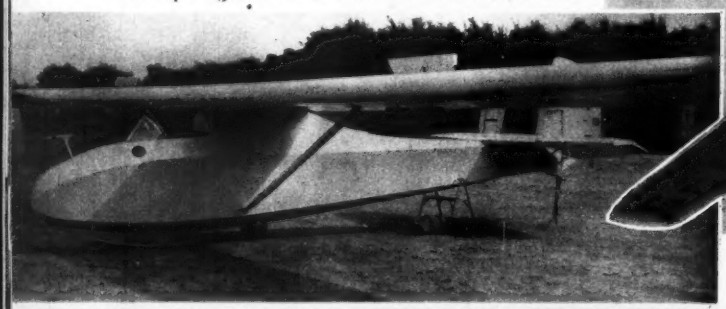
The new four-seater Auster Avis which has four entry doors and carries blind-flying instruments and two-way radio. The aerofoil section flaps are similar to those on the Auster Mark VI.

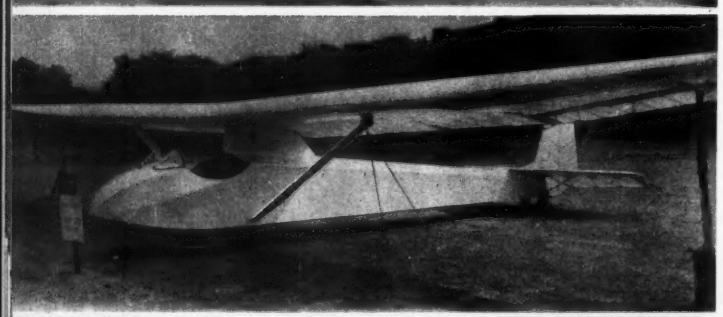
Radlett . . .

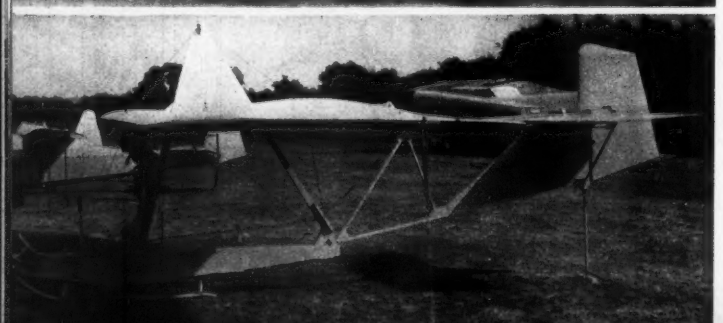
gliders, built by General Aircraft Ltd., for the study of aerodynamic problems related to tailless aircraft, were to be seen at Radlett.

In the glider flying display which took place on Thursday morning, each firm demonstrated one glider. Mr. Kronfeld was first away in a G.A."U" tailless, towed by a Halifax, and at about 2,500 ft., he demonstrated the stalling characteristics of this type in which the nose initially rises because the outer wings are in a stalled attitude behind the C. of G. The Kirby Gull IV which followed, under the expert guidance of Mr. Lance Rimmer, Martin Hearn's test pilot, completed a series of left- and right-hand spins, loops and other manoeuvres which aptly portrayed its handling qualities. A Tiger Moth towed-off the Short Nimbus in which Mr. Weekes gave a pleasing performance, ending with a short landing run in front of the spectators.

The Aerocar, ably flown by Mr. Kemp, is the protocype, which is of mixed wood and metal construction.







Elliots of Newbury used their new 100 h.p. Newbury Eon to tow the Olympia to about 3,000 ft. where Mr. L. Welch cast off and almost immediately found a thermal and stayed at the same height until the spectators began to wonder when he was coming down. His eventual landing was beautifully timed, and he surprised the spectators by finishing his landing run literally in the aircraft park beside the Tudor VII.

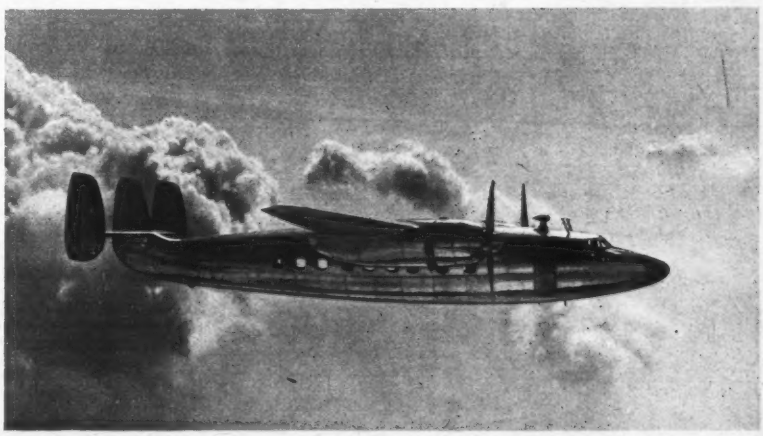
Martin Hearn's Kirby Kite II, with an Auster acting in the role of tug, climbed to 2,500 ft. before casting off, and concluded the Radlett display of British-built gliders and sailplanes with a polished and graceful performance.

An illustrated description of the Static Exhibition will appear next week.

(Top) An attractive newcomer was the Baby Eon intermediate trainer glider. (Centre) Known as the T.21B. the new side-by-side Slingsby will be welcomed by clubs and A.T.C. (Bottom) Elliots of Newbury produce this primary glider as one of their Eon family.

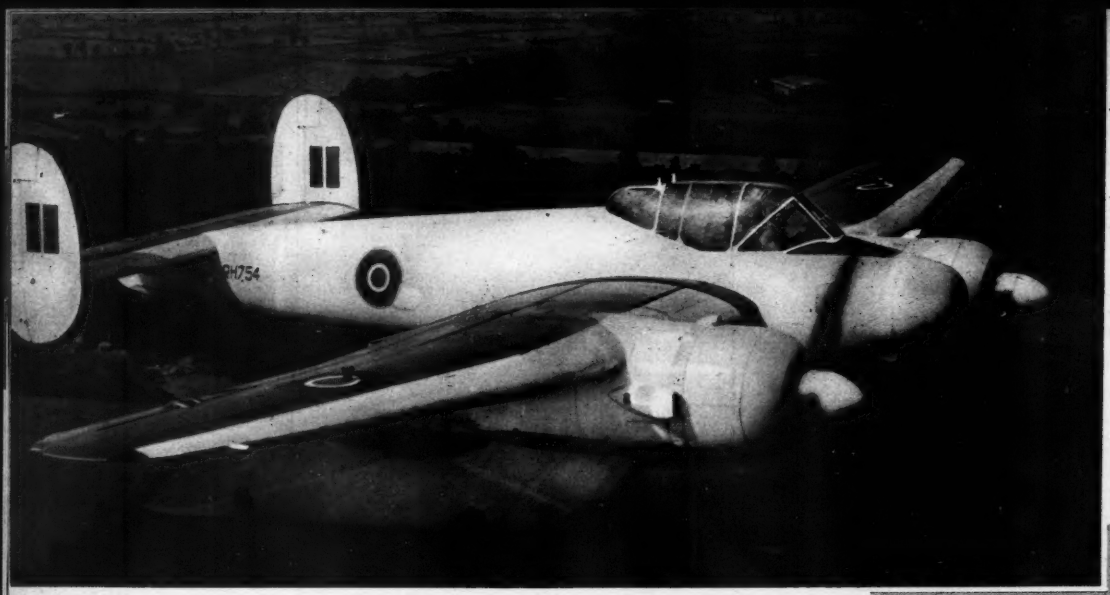
AIR PORTRAITS

The Miles Marathon shows its graceful lines as it rides high in the still air over Berkshire.



Brilliantly designed, sturdily constructed and artistically finished, the Airspeed Ambassador is one of Britain's finest offerings in the transport field.

Romantically, if not altogether appropriately, named Vagabond *is one of British European Airways' fleet of Vickers Viking medium transports. The turbine-powered Viscount has been designed as a successor to this eminently useful type.*

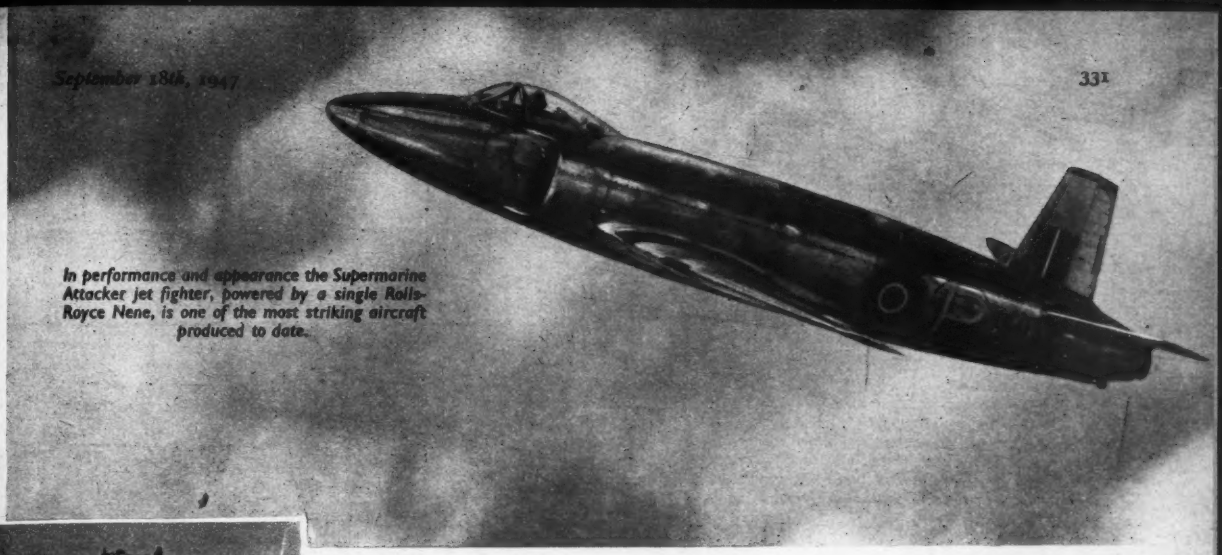


The elegant air of the Bristol Brigand in its Coastal Command colours disguises its true character—that of an exceptionally hard-hitting strike fighter. The Brigand has an unusually long range and is stressed for dive bombing for which function it has "bellows" type air brakes. In addition to the torpedo fighter version, shown above, there is also the Bristol Brigand Met. III designed specifically for meteorological flying. Both have two Centaurus engines, which together give 5,640 h.p. for take-off, but the Met. III is 20 miles an hour faster and also has a better rate of climb. The torpedo fighter version has an all-up weight of more than 5,000 lb over that of the meteorological type.

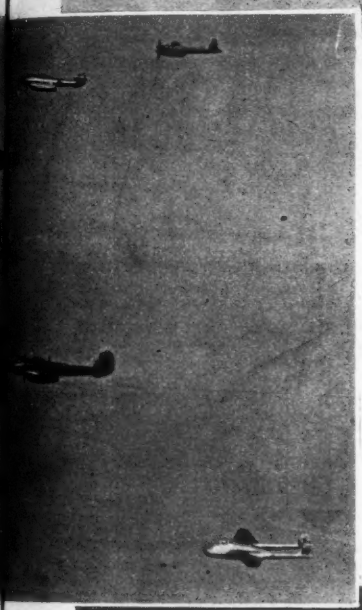
AIR PORTRAITS . . . .

Seen over Derbyshire is a "Heinz" formation of fl test-bed and development aircraft variously powered Rolls-Royce piston engines, pure jets, airscrew turbines mixed power plants. They are, reading from the bot the Nene-Vampire, Trent-Meteor, all-Merlin Lancast Nene-Lancastrian, all-Merlin Lancaster, Derwent Me and Merlin-Hornet.

To absorb the 3,500 h.p. delivered by its 24-cylinder sleeve-valve Rolls-Royce Eagle engine, the new Westland Wyvern deck-landing strike fighter is fitted with an eight-blade Rotol "contraprop."

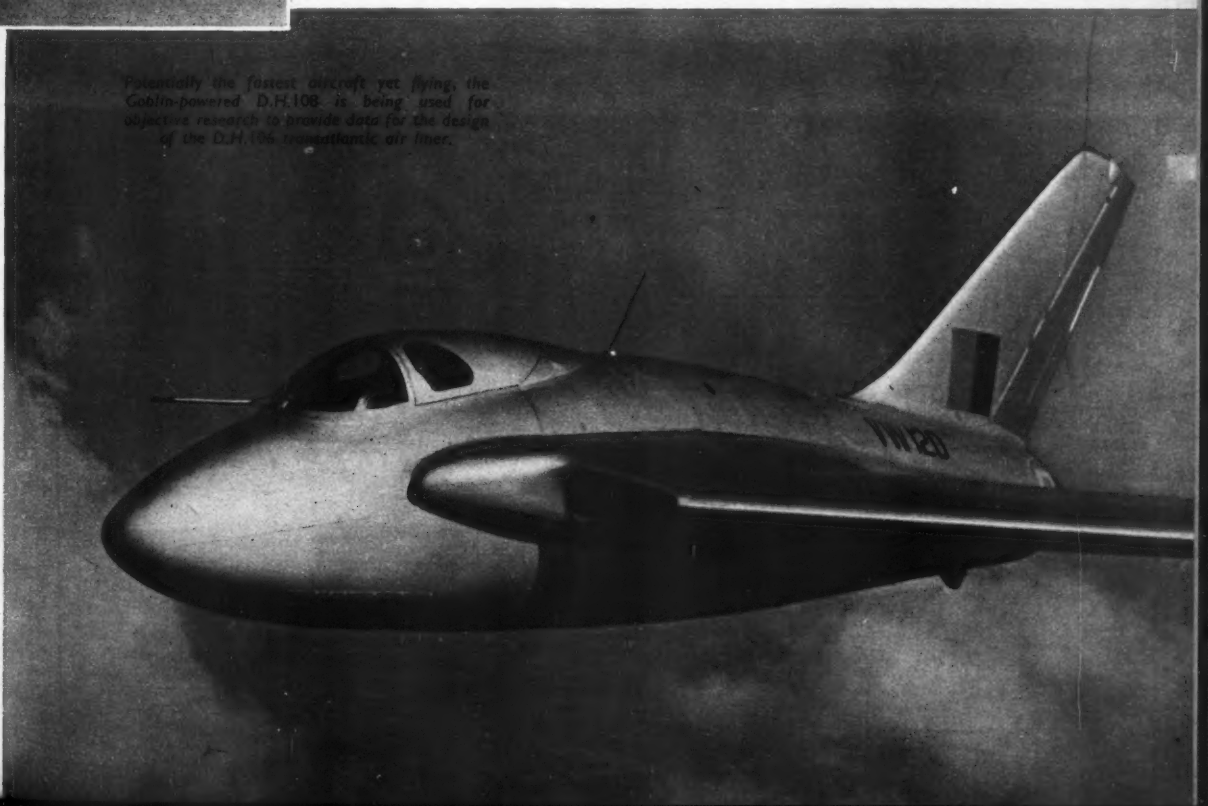


In performance and appearance the Supermarine Attacker jet fighter, powered by a single Rolls-Royce Nene, is one of the most striking aircraft produced to date.



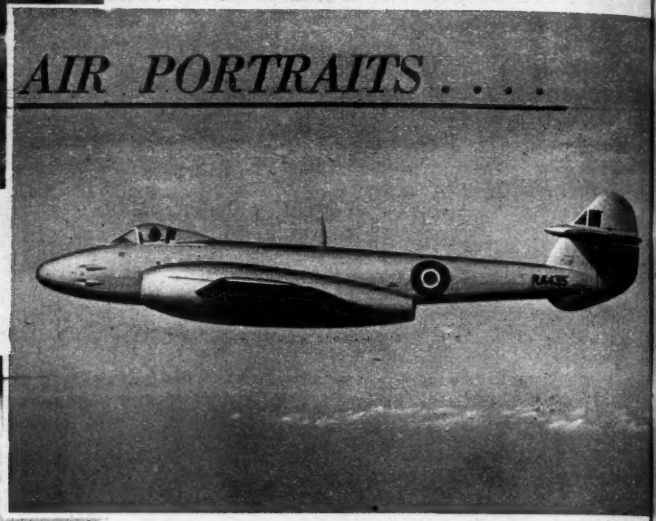
Designed specifically as a deck-landing single-seat strike aircraft the S.28/43 is the latest of a long line of Blackburn naval aircraft.

Potentially the fastest aircraft yet flying, the Goblin-powered D.H.108 is being used for objective research to provide data for the design of the D.H.106 transatlantic air liner.



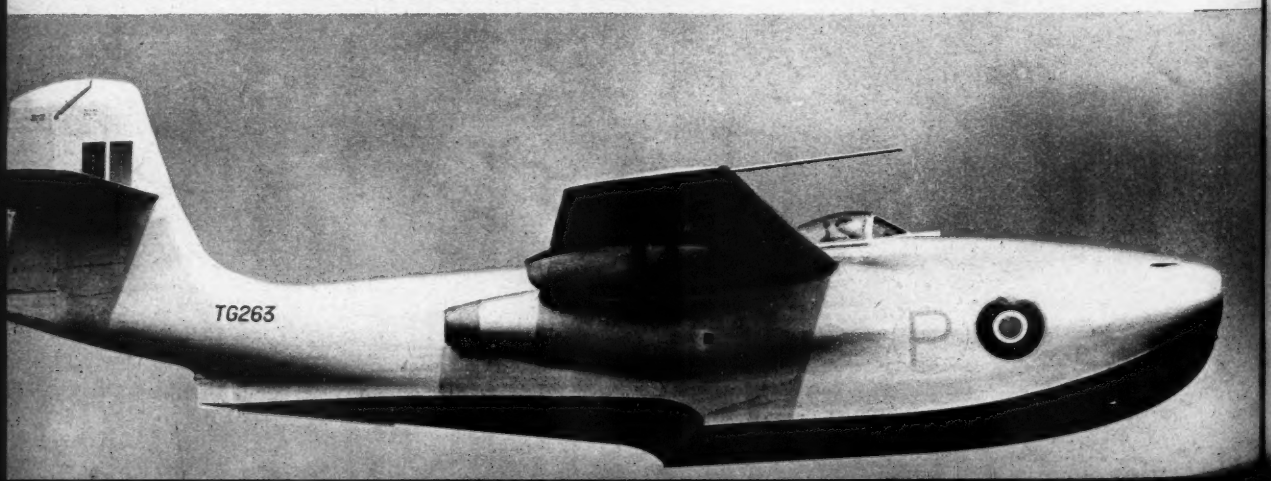
Scion of a long line of famous fighters, which includes the Woodcock, Fury biplane, Hurricane, Typhoon and Tempest, the Hawker Sea Fury combines performance and versatility to an exceptional degree.

AIR PORTRAITS . . . .



Standard twin-jet fighter of the Royal Air Force, the Gloster Meteor IV derives its unsurpassed performance from a combination of clean design—shown to particular advantage in our new photograph—and the 7,200 lb thrust of its two R.-R. Derwents.

Largest and fastest of Britain's military transport aircraft, the Handley-Page Hastings is in full quantity production for the R.A.F. It is very closely related to the Hermes civil transport, likewise in production.



Skimming low past its birthplace at Cowes the Saunders-Roe S.R./A1 jet propelled flying-boat fighter displays features of its advanced aerodynamic and hydro-dynamic design. It is powered by two Metropolitan-Vickers Beryl axial-flow jet units.

R.Ae.S. Garden Party

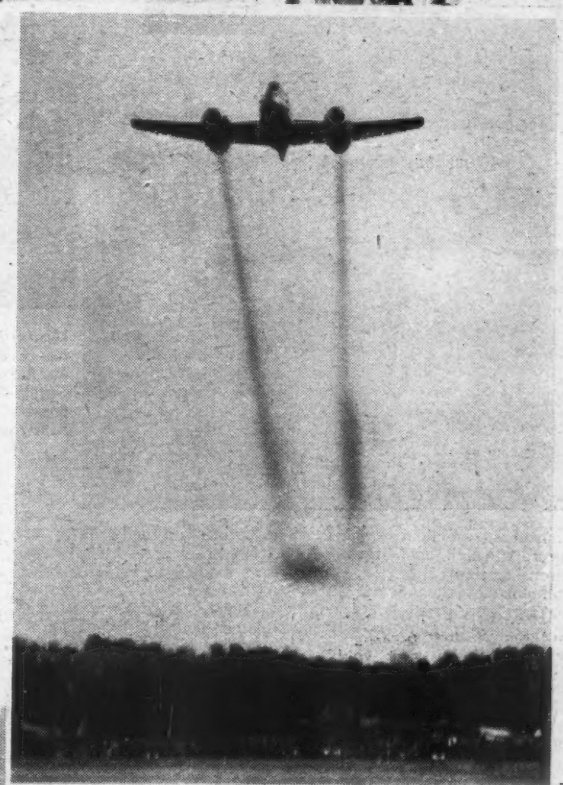
R.Ae.S. Members and Guests see the S.B.A.C. Display

Illustrated by "Flight" Photographs

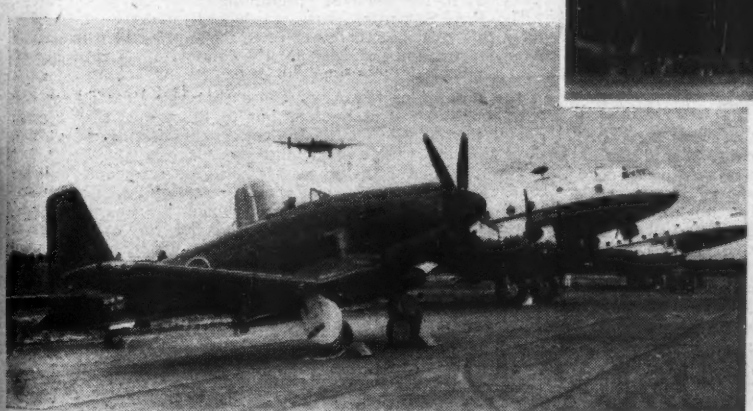
Guests at the Party watch the Boulton Paul P. 103 put through its paces by Mr. Lindsay Neale.

ANNUALLY the Royal Aeronautical Society arranges its garden party on the Sunday following the S.B.A.C. exhibition, and this year the Handley Page airfield at Radlett was again made available for the purpose. But for the welcome presence of wives and families, and the pleasant social atmosphere, the garden party is much like another day of the exhibition which precedes it; in fact, due to the tremendous increase in scope and size since the first S.B.A.C. display fifteen years ago, an extra day was welcomed by many members of the R.Ae.S. this year to enable them to complete their inspection.

It seemed that the weather might mar the flying programme, but at midday rain ceased and cloud cleared sufficiently later to permit even the jets to show their paces without handicap. After the circus of large transports and the Brigand demonstration which had been consistently polished throughout the week, the jets took off in turn to entertain. The clipped Meteor IV, flown by S/L. Waterton, was outstanding, and by comparison with most displays this year distinctly "dicey." From one huge loop it pulled out at high speed with very few feet to spare, and in its passage across the airfield it produced not only an unusual sound phenomenon resembling small thunderclaps a few seconds behind it, but also turned up strange snakes of dust from the dry earth.



(Below) The Halifax tug comes in over the Firecrest and Hastings after releasing the General Aircraft tailless glider. (Right) S/L. W. A. Waterton flying the Meteor on which he put up such a thrilling show.



Mr. Cunningham gave one of his best displays of the week on the D.H.108, finishing up with very tight vertical-bank turns round the airfield. The Attacker, after one impressive fly-over, unfortunately had to retire because a wheel seemed unwilling to lock in the up position. The undercarriage lowered and Mr. Lithgow landed the Attacker normally.

Flights by military and civil aircraft and gliders followed the jets, and in spite of the competition the contra-prop Seafire 47 demonstration was

SOME GUESTS AT THE PARTY

Mr. Peter Masefield, Sir Frederick Handley Page and Mr. E. C. Bowyer.

Lord and Lady Sempill, left, with Sir Oliver and Lady Simmonds.

Major Nicholl, centre, with Major and Mrs. J. M. Cordes.

G/C. and Mrs. Isherwood.

Left to right. Lady Handley Page, Mr. E. S. Thompson, Sir Roy Fedden and Mr. S. T. Robinson.

(Above) Mr. Leslie Irvin. Mr. H. W. McKenna and Mr. R. Perfect. (Left) Mr. Griffith Brewer and Miss Barwood. (Right) Mr. T. P. Wright and Mr. S. M. Fairchild.

considered excellent. The medium U-form engineless research aircraft which opened the glider-flying was preceded by the circus of light aircraft. Both classes seemed to be under the influence of the fighter types, and little two- or four-seater aircraft were to be seen swooping and rolling round the field in a spectacular manner, while sailplanes hell-dived and aerobatted—proving, no doubt, the amazing structural strength of their long, tapered wings but shattering many illusions that engineless flying is a gentle, graceful and relaxing sport comparable with the soaring of gulls above a ship.

The expressions on the faces of visitors examining the variety of alternative loads which can be carried by the Mosquito were most amusing to watch. The huge 200-gallon drop tanks interested them, the bombs and mines surprised them, the six-pounder gun astonished them, and finally the old kitchen stove, unobtrusively laid out with the other equipment, caused expressions of amazement quickly followed by understanding and hoots of laughter.

A word of praise must be said for "The Planning of the Plane"—an amusing parody on the hunting of the Snark contained in the souvenir programme.

The R.Ae.S. garden party was voted an excellent function again this year, but there was room for improvement in feeding arrangements and provision for the comfort of so many guests.

The Guildhall Dinner

(*Concluded from page 316*)

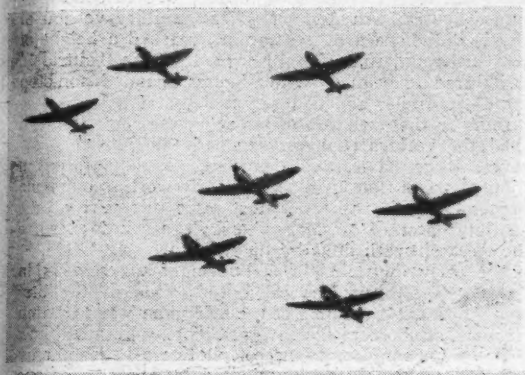
Aeronautical Sciences, giving an account of what he called "the education of an American in one month," said that a month ago he was in California where 300 or 400 members of the I.Ae.S. had attended a banquet to celebrate their fifteenth anniversary. With the background of Hollywood, where traditions were neither deep nor too old, they had really felt a splendid maturity on that occasion. From California they had come to New York, and a week ago about 40 members had dined at the splendid home of the R.Ae.S. in London. There they were shown the archives of the R.Ae.S., and the fifteen years of the Institute had paled into insignificance. The Society, at 81, had seemed really old, but now they had come to the Guildhall which was more than 500 years old.

There was a time, Mr. Bassett continued, when the Guildhall was a meeting place for the Guilds. Centuries ago, men of the professions began to realise that they had a responsibility not only to each other but to the people they served. The visitors to the Guildhall that evening felt cognisant that they, too, had that responsibility.

The tree of aeronautical science had grown so many branches that the aeronautical engineer felt sometimes like a squirrel in a great oak tree, wondering which branch to explore. Consequently the time was auspicious for the two bodies to get together. They had all profited very much by their joint meeting, not only in good fellowship but in the fact that, although there were many differences of opinion, there was more than one way of solving most of the problems. Any differences in the thoughts of the two bodies was merely a phase difference. That was all to the good. The success of the Conference had been even greater than expected, and he hoped next year many of their colleagues would go to the United States to attend the next joint meeting.

Navy Display at Yeovilton

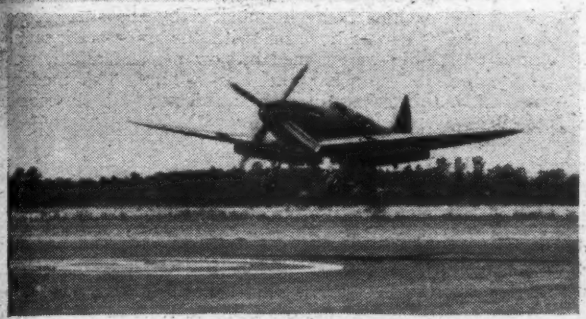
More Illustrations of the Successful West Country Air Day : Jet and Airscrew Fighters Demonstrated



(Left) Seafires and Fireflies of No. 700 Squadron in neat formation over the airfield.

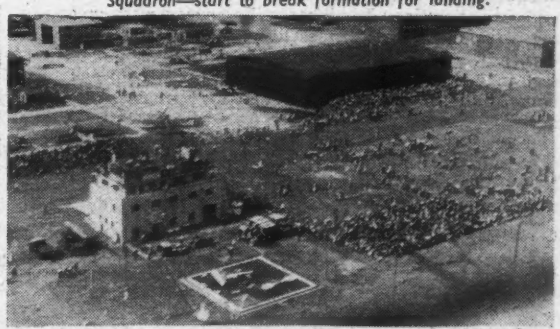
FOLLOWING last week's description of the Naval Air Day, so ably organized by H.M.S. *Heron* (R.N.A.S., Yeovilton), we present some more exclusive photographs of the excellent flying display which implemented the static exhibition portraying the activities of this training station for air mechanics.

Admiral of the Fleet Sir James Somerville was present to open the display, and the very large number of visitors testified to the interest shown by Somerset and the surrounding counties in aircraft and their first big air display of the year. In addition to squadron Seafires and Fireflies based at Yeovilton and older types used in the training of air mechanics, a Sea Vampire, Meteor IV, Sea Hornet, Sea Fury, Seafire 47 and Firebrand were among the visiting Naval aircraft.

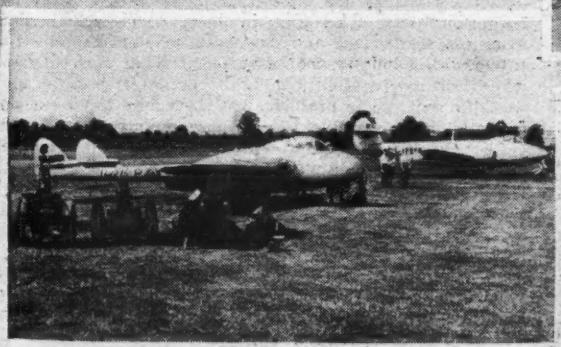


Lieutenant Goodhart lands after a display of aerobatics on his Seafire. (Below) A convincing demonstration of the Meteor's speed range was given by W/C. Dodred-Dell.

Fireflies—a part of the equipment of No. 700 Flight Testing Squadron—start to break formation for landing.



A part of the very large crowd on the "deck" of H.M.S. "Heron." The visiting aircraft park is in the background.



The Sea Vampire and Meteor jet fighters were visitors to Yeovilton. (Right) The surprise fly-over of the Westland Wyvern with Mr. Pete Garner at the controls was an added thrill.

Helicopter Development

Igor Sikorsky on Recent Achievements and Future Prospects

NO one man can be said to have contributed more towards bringing the direct-lift type of aircraft to a practical stage than Mr. Igor Sikorsky. It is not merely that he was one of the very first among the early experimenters (he built his first helicopter in 1908-9), but after an interval of many years, during which he designed some very good fixed-wing landplanes and flying-boats, he returned to his first ideal, and in 1939 he flew what was to be the forerunner of a long line of helicopters, the VS-300. Since then he has never forsaken his work on the helicopter nor his belief in its great future.

It was thus a happy inspiration on the part of the Helicopter Association of Great Britain to invite Mr. Sikorsky over here to give a lecture on his development work, centred in the Sikorsky Division of the United Aircraft Corporation at Bridgeport, Connecticut. The lecture (talk would be a more appropriate word, as Mr. Sikorsky spoke *ex tempore* in a chatty and wholly charming style) was held in London on September 8th.

After underlining the fact that fixed-wing aircraft are helpless without expensive airports, thus failing to supply complete freedom of travel, Mr. Sikorsky quoted examples of how the helicopter, in spite of its short existence, already had a wide background of achievement. During the war it was put into service in the Pacific, in India, in Burma and in China, doing rescue and similar work which no other vehicle could perform. Helicopters were also used on the floating repair bases, Liberty ships which went to the Pacific Islands to supply maintenance for the B-29 bombers. Thus it could be said that these bombers were kept in the air by helicopters, which flew urgently needed spare parts to the ships before shops could be established ashore. He also recalled the more recent rescue work in Newfoundland and Labrador.

Multifarious Duties

Specific helicopter successes experimentally established included crop-dusting, forest-fire patrols, mail-carrying and similar duties. In all cases there was a very great saving of time, and sometimes lives. He mentioned one instance when an oil-carrying barge had stranded on a reef in a November gale. It would break up in a few hours, and the sea was too rough for surface craft. The mishap occurred not very far from the Sikorsky works, and in a very short time a helicopter had rescued the two men and deposited them safely on the shore. After the lecture, this incident was illustrated by a genuine film, not "staged" in any way but taken at the time.

"Flight" photograph

AT RADLETT: Mr. Sikorsky (centre) with Major M. E. Wright (right) and Mr. F. H. Dixon who showed him over the new Fairey Gyrodyne.

By way of illustrating how far the helicopter had advanced in recent years Mr. Sikorsky quoted some performance figures. An Army R-5 (the military version of the S.51) did a speed of 114 m.p.h., reached a height of 21,300ft light and 16,000ft fully loaded. With "outside" seats it lifted 18 people. Other figures included non-stop flights of 700 miles and a duration flight of 10 hours.

Turning to the evolution of his helicopter, Mr. Sikorsky recalled the various changes that had taken place. As, however, these have been described and illustrated in this journal from time to time (the early work in our issue of September 3rd, 1942) we must omit this part of the lecture and proceed to Mr. Sikorsky's account of some of the research work done by his firm.

In the early days little was known of the stresses in the blades and hub of a helicopter. One of the first attempts to learn something of the behaviour was to watch the blades stroboscopically. Mr. Sikorsky recalled how he had the uncanny experience of piloting a helicopter by night, the machine being illuminated by the stroboscope lamp only. He was hovering with the rotor stationary! Later the blades were filmed in slow motion, and it was frightening to see what the blades did. The modern method was to use strain gauges, and now it had become possible to estimate the stresses with fair accuracy.

Freak Stresses

Mr. Sikorsky referred to the recent S.52 model, which has metal blades (previous models have plywood and fabric covering). When the test department was measuring the stresses in these, some extremely high values were recorded, much too high to be tolerated. Ultimately it was found that the high peaks shown on the curves were due to the measuring instruments being in resonance with the blades; the real stresses were about what had been expected.

Of the future Mr. Sikorsky said that the main principles were now well known. Practical application of those principles was difficult, and for some years there would be different approaches. These could be broken down into multiple-rotor systems, twin-rotor systems with the rotors superimposed, side-by-side, or in tandem. The most popular type was the single main rotor with a torque-compensating device. It was his view that this last was the most practical configuration for helicopters developed up to the present time. The helicopter had followed closely the development of fixed-wing aircraft, from triplane to biplane to monoplane. The monoplane with control at the tail was the type that had survived.

Mr. Sikorsky stressed the importance of powerful and accurate control. He quoted an instance of a Navy helicopter on floats. The officer in charge considered the floats a useless deadweight and devised a scheme whereby they could be left behind on the surface. That was easy, but when it came to alighting on the pontoon gear the story was different. The problem was solved by having a ring, mounted at a suitable height, permanently on the float gear. On the helicopter was a pointer, and when the machine was so manœuvred that the pointer was in the ring, and then dropped quickly, it landed in the right place on its pontoons. The manœuvre was performed many times and showed the accuracy of control that could already be achieved.

Reference was made to the possibility of applying the power to the rotor blades direct, perhaps by some form of jet at the tips. This would, if praticable, save much weight and complication but would have to be paid for in higher fuel consumption.

During the discussion Mr. Sikorsky gave some interesting information about de-icing. They had found, he said,

"Flight" photograph.

The Mosquito night fighters from West Malling, with "Flight's" representative in No. 3 of the leading flight, are seen against one of the few clouds over London at 2 p.m. last Monday.

BATTLE OF BRITAIN FLY-PAST

Over London in a "Group III" Mosquito

THOUGH "zero hour" in the Battle of Britain fly-past over Whitehall was set back, for meteorological reasons, from 11 a.m. to 2 p.m. last Monday, Londoners were not disappointed. Representative formations from Fighter, Bomber and Coastal Commands, B.A.F.O., Naval Aviation, the U.S.A.A.F. and the Czech Air Force commemorated the great victory of seven years ago in a worthy manner, and marked the opening of celebrations which will culminate over the week-end with an "open day" at R.A.F. stations and a thanksgiving service in Westminster Abbey.

This year *Flight* was privileged to fly in one of nine Mosquito Mk 36 night fighters drawn from squadrons at West Malling (Station Commander W/C. M. G. F. Pedley, D.S.O., D.F.C., A.F.C.). Our machine was No. 3 in the leading flight of Group III, embodying eighteen Fighter, three Coastal, six Bomber and nine B.A.F.O. Mosquitoes, nine Spitfires (Fighter Command), three Seafires (Naval Aviation) nine Thunderbolts (U.S.A.A.F.) and six Czech Spitfires. This comprehensive formation was led by S/L. J. Singleton, D.S.O., D.F.C., A.F.C., and to F/L. E. G. N. Mold fell the responsibility of navigating.

While the other Mosquitoes were taking station at 2,000ft in the Portsmouth area, cloud confronted us, necessitating two abrupt changes of height, but once course was set along the South Coast the sun beat down on the beaches with little opposition. Near Brighton the Spitfires and Seafires joined in, though we were unable to see them, and over Beachy Head the American and Czech contingents brought us up to our full strength. Turning inland we saw Canterbury Cathedral rising glorious from the plain (we remembered watching from its very shadow the fiery end of a Dornier) and to our right the Isle of Thanet lay clearly defined. We crossed the base of Southend pier dead on time, but as S/L. Singleton had feared (for a loss or gain of a few seconds over London is well-nigh inevitable, probably due to wind fluctuation) we were 27 seconds late as we crossed the zero line.

The stream of high-speed fighters comprising Group IV (six Hornets, twelve Tempests, eighteen Meteors and nine Vampires) were even later, but were rapidly overhauling us as we turned at Hammersmith for a circuit of London. Over the docks once more, our pilot, F/L. C. C. Smith, pointed out the B.A.F.O. Tempests, some in silver finish, drawing alongside. They veered away as Hendon airfield came into view.

Of the lone Hurricane which had displaced three Sunderlands as "Group I," and of the twelve Lancasters (nine Bomber and three Coastal) which made up Group II, we saw nothing.

On the homeward course, S/L. Singleton gave orders for the vertebrae of our "tail" to break away and return to base. We ourselves assumed a line-astern formation as we neared Maidstone and the proximity of a Mosquito's tail unit a very few feet beyond our windscreen (small stencilling on the elevator was quite legible) set us musing that visitors to West Malling next Saturday should be well satisfied with the standard of formation flying.

Hasty Vampires

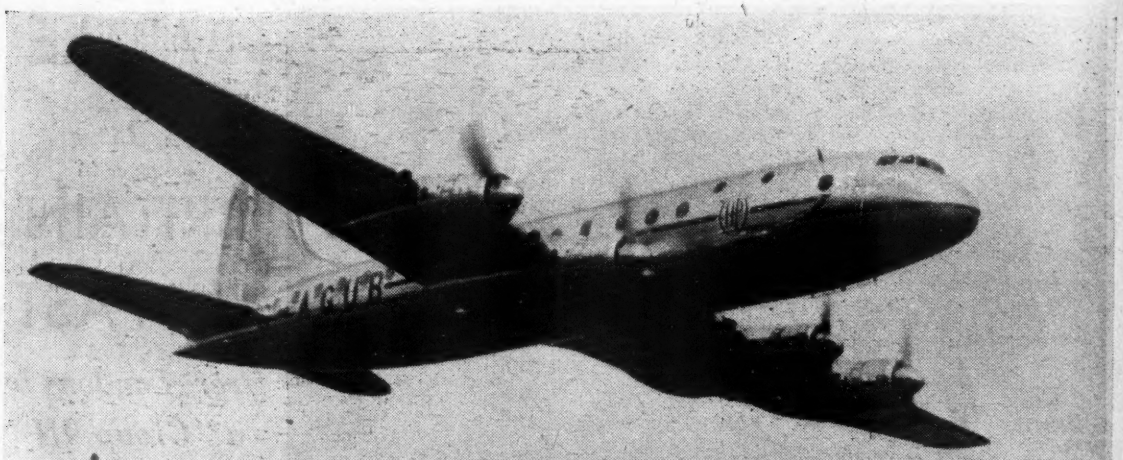
Below us, flights of silver Vampires, the pilots of which were finishing their lunch as we had taxied out for take-off, were back at their dispersal. They had been cruising throughout at 290 m.p.h., whereas our A.S.I. had read a steady 220.

After two hours or so in the air the Mosquito pilots were suffering in a minor degree from "formation neck" and the lassitude which comes after a Turkish bath, for the cockpit of the Mosquito is notoriously hot. Nevertheless, they soon set about readying themselves for the second fly-past over south-west England. About seventy aircraft rallied round Selsey Bill for the first part of this flight and were subsequently seen over Southampton, the Isle of Wight and Bournemouth. Here the single-engined fighters broke off. The Mosquitoes were prevented by weather from reaching Exeter but are reported to have passed over Yeovil, Bristol, Bath and Salisbury and other West Country towns.

Helicopter Development (Cont.)

that the danger was there, although not so great as had been thought. In ordinary use no trouble had been encountered, but by taking a helicopter up into the Adirondack Mountains they had succeeded in getting ice to form. It appeared that the pulsations and centrifugal force kept blades fairly free, but there was no difficulty in clearing them by electric heat. Constant application consumed rather a lot of power, but by so arranging things that the heat was applied to a portion only of the blade for some 20 seconds, and then applied to another blade portion, it had been found possible to reduce consumption to something like two kilowatt, and the de-icing was quite satisfactory. The rubber strips used on fixed-wing aircraft could not be used on helicopters, the blades of which are very sensitive to contour changes.

The lecture was followed by a number of very excellent and instructive films, many in colour, showing helicopters in action. One "short" was taken over the lip of a volcano from a hovering helicopter. Another was of the rescue of two men from a stranded barge, to which reference has already been made.



CIVIL AVIATION NEWS

"Flight" photograph.

FOR TRIALS: The Hermes II was built exclusively for trial flying and will not go into series production. It can be regarded as the prototype for later models such as the Hermes IV, 25 of which are now on order for B.O.A.C. A military version, the Hastings, is in production for the R.A.F.

B.S.A.A. BALANCE SHEET

THE directors of British South American Airways, Limited, have issued an Interim Report and Accounts to cover the period of four months from the date of the previous accounts to the date of the transfer to a nationalized Airways Corporation. It will be remembered that the company was originally formed in January, 1944, by shipping companies and was then called British Latin America Airlines, Limited. When the Government announced its nationalization plans it was decided that the company should form the nucleus of a new Corporation and B.O.A.C. bought all the shares from the shipping companies. On August 1st, B.S.A.A.C. came into existence and the B.S.A.A.L. shares were bought back from B.O.A.C. The accounts therefore cover the period from April 1st to July 31st, and a profit of £56,729 1s 9d is shown. The four months' profit wipes out the debit to profit and loss account and covers some preliminary expenses of £4,500 not yet written off. The Corporation therefore started operations on August 1st with no debit for past losses or development expenses. During this short period the Company were operating with Lancastrian and York aircraft at virtually 100 per cent capacity.

THE TUDOR II CRASH

ACCORDING to a statement issued last week by the Ministry of Supply, the aileron controls were reversed on the Tudor II airliner which crashed at Woodford airfield on August 23rd killing four people including Mr. Roy Chadwick, Technical Director of A. V. Roe, and Mr. S. A. Thorn, the firm's chief test pilot. The statement points out that the behaviour of the aircraft during its final flight was consistent with this condition, and adds that it is significant that a new control assembly was fitted the day before. The circumstances are being further investigated by the Accidents Investigation Branch, who will make a full report in due course. Steps are being taken by the firm to alter the design so that the assembly of the control system with reversed connections is mechanically impossible, but these steps will not materially affect the production programme of the Tudor aircraft.

AIRPORT VISITORS

DURING the first seven weeks that London Airport has been open to the public 130,000 visitors have watched flying and more than 5,000 have made conducted tours around various aircraft. In just over a fortnight Northolt had 38,000 people who paid for admission and of that number 1,400 took flights over London and 4,150 made conducted tours. Blackpool Airport was also well attended and during July there were more than 10,000 visitors, and in the first half of August there were 9,000 visitors.

OSLO CONFERENCE

AT the International Air Transport Association Conference in Norway at the end of last month it was decided to create night mail and freight services on an extensive scale to operate over Europe during the coming winter. The members appeared to be satisfied that conditions over Europe had improved to allow all-the-year-round operation. Rates and fares are to remain at the present level, even though there has been a greater expense to airlines this year. Members agreed to grant larger discounts on bulk cargoes in Europe and an effort is to be made to attract the carriage of freight in other categories. It was proposed that in order to provide the travelling public with a more flexible service, traffic should be interchangeable between airlines, railways and shipping lines. It was also decided to make shipbrokers eligible as agents for the sale of air transportation.

The Association will publish at the beginning of next year an Air Guide containing a comprehensive directory and timetable of scheduled air services in Europe.

AIR TRAFFIC RULES IN U.S.

A GENERAL revision of air traffic rules in the United States has been made by the Civil Aeronautics Board in which special provisions have been made for helicopter operations. The new rules specify that conventional type aircraft may not be flown at a height less than 1,000ft above the highest obstacle when in congested areas. The previous regulations specified 1,000ft above the ground as being the lowest limit for flight. Helicopters were bound by the same rules as conventional aircraft in the previous regulations, but they may now be flown as low as desirable over congested and uncongested areas, provided there is no danger to property on the ground and that due allowance is made for a possible emergency landing.

A special section has been devoted to instructions with regard to aerobatics and with warnings against reckless flying and deliberate disregard for traffic regulations. Other sections deal in some detail with procedures for flying in V.F.R. and I.F.R. conditions.

Mr. Truman's special board of enquiry on air safety has been studying flying procedures on routes over high ground, and has made some recommendations. It is considered that the minimum altitudes in I.F.R. conditions should be standardized over each route flown by passenger aircraft. Pilots should not be permitted to fly, except in emergencies, below the prescribed minimums in I.F.R. conditions. It was thought that with the approval of the air line operators, air line pilots and government officials, these standard minimum route and initial approach altitudes could be brought into effect immedi-

ately. It was also recommended that the absolute minimum height for all aircraft carrying passengers for hire should be raised from the present 500ft requirement to 1,000ft above the ground, except for such cases under V.F.R. conditions by day, when with C.A.A. approval, lesser altitudes could be flown without affecting adversely the interests of safety.

The Board recommended that in cases where pilots were flying at or above prescribed minimum I.F.R. altitudes and V.F.R. conditions were then encountered, a descent should be made to a height 1,000ft above the ground after securing approval from air traffic control. In cases where contact flight could be made but with less visibility than three miles and without 500 separation from the clouds, then separation from other aircraft would still be necessary from air traffic control. These were considered to be emergency measures, and the board urged that every effort should be made to develop adequate collision warning indicators.

The safety board will continue to meet and make further recommendations.

AUSTRALIAN EXPENSES

THE cost of one year's civil aviation operation to the Australian Government has amounted to £1,288,020. Expenses incurred in the operation and maintenance of radio stations was £47,178, and in the maintenance of landing grounds £23,905. Meteorological services within the continent required £198,000, miscellaneous services £54,649, and for general stores and equipment £45,171. In addition to this, administration salaries amounted to £6,000 and depreciation and interest on capital £286,250. There were other expenses to cover, the teleprinter service £7,866, and charges by other departments for various repairs which amounted to £25,000. It has been estimated that civil flying activity in Australia consumes about twenty million gallons of fuel a year which, at the rate of 9d per gallon tax, would yield £750,000. The Australian airline operators consider that the revenue received on petrol taxation, if used to relieve civil aviation expenses, would be a reasonable contribution and would make possible a substantial reduction in the high landing fees recently imposed.

B.O.A.C. SERVICE TO CEYLON

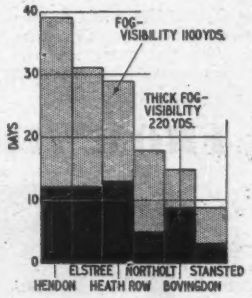
BRITISH OVERSEAS AIRWAYS started a daily service on September 8th between London and Karachi with York aircraft. Yorks are replacing the Haltons on this route and on the weekly service to Colombo. Also owing to repairs on the runway at Basra the route will be temporarily diverted through Lydda and Dhahran instead of as at present through Cairo and Basra. Lydda will be used instead of Cairo to avoid a long flight to Dhahran.

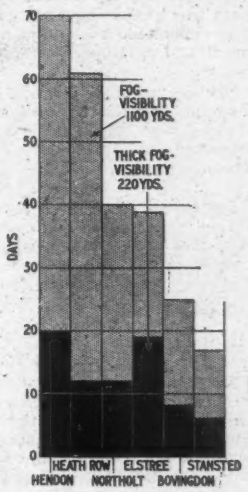
The complete schedule to Colombo has been replanned, and the time taken for the journey is now reduced by twenty-four hours to two and a quarter days. The time taken for the journey to Karachi will be about one and a half days.

As at present, four of the services each week are extended from Karachi to Delhi and Calcutta, and the flying-boat and Lancastrian services through Pakistan and India to the Far East and Australia are unchanged.

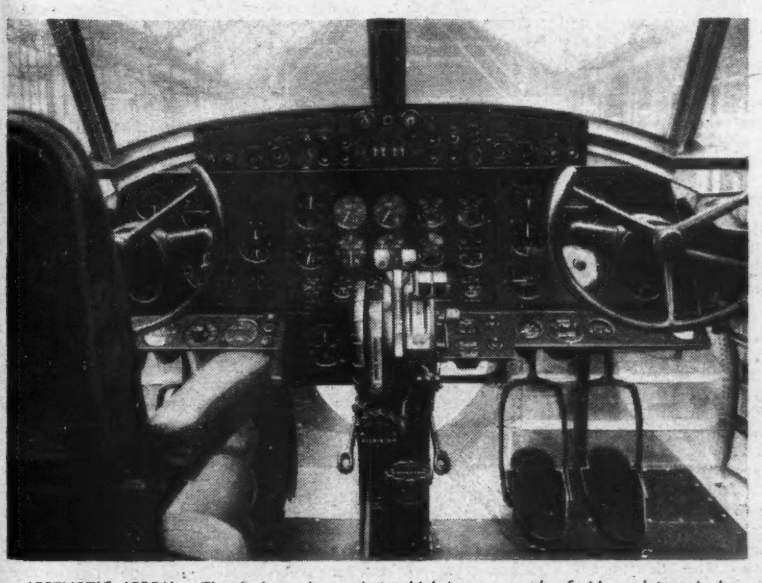
FOG INCIDENCE AT AIRPORTS

A WEATHER survey has been made by the International Meteorological Consultant Services, Ltd., for London Aero and Motor Services of visibility incidence at airports around London. The figures are based on Meteorological Office returns made in 1936 and 1937. Observations for Stanstead were made at Furneaux Pelham, three miles from the position of the airfield, and they were checked by readings made at Pleshy, which is about three miles on the other side of the airfield. Those for Bovingdon were made at Marsworth Yard, five miles from the airfield, and, if anything, gave better readings than those for Bovingdon, whereas the readings at Heathrow, which were taken at Twickenham, may be somewhat poorer than those for London Airport.





The graph drawn from the figures shows a definite trend, but the actual number of days indicated cannot be conclusive as the figures for two years in succession cannot provide sufficient data. Visibility over a large area surrounding London depends almost entirely upon wind direction, and as the prevailing wind is south-westerly, one would expect visibility to be poorer on the north-eastern side where Stanstead is situated. It may be, therefore, that in those two years 1936 and 1937 north-easterly winds were unusually prevalent, and it would be interesting to compare figures for these airfields over a longer period.



AESTHETIC APPEAL: The Ambassador cockpit which is an example of tidy and practical design. The pedestal is particularly clean and for a pressurized cabin the windscreen is deep. Pilot comfort has also been considered and each seat has separate thigh rests which work differentially.

BREVITIES

A NEW company, British Nederland Air Services, Ltd., has been formed jointly by the Nederland Shipping Company and British interests.

* * *

The Air Registration Board have reissued *Notices to Licensed Aircraft Engineers and to Owners of Civil Aircraft Numbers 4, 17 and 20.*

Notice No. 4 contains a list of airscrews approved for use in civil aircraft and holding C's. of A. *Notice No. 17* is in connection with dispensation regarding the issues of Certificates of Safety by engineers other than those holding licences, and *Notice No. 20* concerns T.K.S. de-icing systems and introduces a scheme for discontinuing the use of T.K.S. H.70 Fluid.

* * *

An M.F. Beacon has been lent by Pan American Airways for installation at Hongkong Airport. Work has begun on the construction of the station at Whelan Island at the eastern end of the colony.

Civil Aviation News . . . . .

The Martin 202, which in August became the first American airliner type of post-war design to be certified by the C.A.A. for airline use, will, it is understood, be put into service this month on North-west Airlines routes

* * *

An Aerogram service in both directions—air to ground and ground to air—is now available to passengers travelling in TAA Skymasters flying between Melbourne, Adelaide and Perth. It is believed that this is the first two-way service in the world.

* * *

The Australian Civil Aviation Department has cancelled a permit granted ten months ago for operating air services on a route which offers competition with the State-owned railways. It is understood that other applications are being held up by the State Department for similar reasons.

* * *

Discussions on the terms of an agreement between the United Kingdom and Czechoslovakia governing the operation of air services, were concluded in London on September 9th, and it is expected the Agreement will be signed in Prague in the near future.

* * *

The British Air Charter Association Traffic Office at Croydon will be closed after September 30th. It is understood that companies not normally based at Croydon but flying into the airport are now able to arrange for their traffic to be handled by those companies with traffic staffs.

The *Golden Hind*, which was recently taken out of service with B.O.A.C., is now for sale. It was suggested at one time that this remaining "G" Class flying boat might be used for air cruises, but the idea was apparently abandoned, and it may be assumed that if no buyers are forthcoming the flying-boat will be broken up. * * *

Last month Swissair made a training flight across the North Atlantic with a Skymaster. Landings were made at diversion airfields, and range flying, navigation, wireless and met. conditions were studied. The return flight was made via the Azores. * * *

The route mileage covered by B.E.A. (English Division) in February, the first month of operation, was 1,516 miles. In July the route mileage had increased to 2,907 miles. During the same period the number of passengers carried increased from 2,988 to 36,723, and the total carried in the six months was 107,912. More than 490 tons of freight was also carried during the same period.

* * *

The Pan-American service to San Francisco and Tokyo will start on September 25th. The route will be through Honolulu to Wake Island and thence direct to Tokyo. The service will actually be extended to Shanghai and Hongkong-Bangkok-Siam to Calcutta to make direct connections with Pan-American aircraft flying eastwards.

* * *

On September 3rd the American Overseas Airlines Constellation, the *London Mercury*, left La Guardia to make the 15,000th transatlantic crossing by the company. The crossings have been made in five years and include regular schedules and the military and naval contract operations during the war.

FROM THE CLUBS

TWO members of the Luton Flying Club accomplished their first solos during August and both have now obtained their "A" licences. The election of 20 full flying members to the club during the month has brought the number of full flying members up to 200 and the total flying hours for the month was well over 300. The club's Rapide is still doing sterling work and flights made during August included trips to the Isle of Man, the Channel Isles and the Continent.

* * *

The W.J.A.C. has now announced the winner of the flying scholarship for the North of England area. She is Miss Dorothy White, of 14, Marina Grove, Runcorn, Cheshire, who has been a keen member of the W.J.A.C. since 1942. She will take her flying training for her "A" licence at Barton airfield during week-ends.

* * *

At Elstree, the United Services Flying Club flew a total of 201 hours last month. The air pageant held there recently has resulted in many new members joining the club, and membership now numbers 243. The activity of the club has been augmented with the influx of the American Embassy Flying Club, which has now moved its headquarters from White Waltham to the Elstree airfield.

* * *

The first glider crossing of the Solent was made recently by Mr. R. E. Pears, a company director, of the Surrey Gliding Club, in an Eon Olympia. Mr. Pears was towed off from Redhill and released 2,000ft over the airfield at 12.55 a.m. Immediately finding lift, he soared to 5,000ft, in cloud, and with a moderate northerly wind he reached Portsmouth and then flew west along the south coast before turning south and landing at Cowes airport at 15.50. He was met by Mr. Russell Gunton, managing director of Somerton Airways, Ltd., who arranged a tow back to Redhill by an Auster Autocrat later in the day. * * *

No time was lost by the Cambridge and University Aero Clubs during the good weather of last month. They flew every day and brought their monthly total of flying hours up to 275. This figure included five hours' night flying for "B" licence tests, cross-country flying and a considerable number of aero-tows carried out for the Cambridge University Gliding Club.

The three-seater Newbury Eon gave its first public demonstration at the Radlett Display. Built by Elliot's of Newbury it has a Cirrus II, 100 h.p. engine. A second prototype is to be produced powered by a 125 h.p. Lycoming engine.

Two first solos and "A" licence tests were successfully completed during the month.

* * *

The large crowd who attended the Air Rally at Cowes Airport on Sunday, September 7th, was disappointed to be faced, after five months of continual sunshine, with a dull day of unbroken cloud and showers of rain. However, some 4,000 people and fifty aircraft attended during the afternoon. It was regretted that some fifty visiting club aircraft were unable to attend on account of the widespread bad conditions.

The flying programme proceeded in a modified form. Displays and demonstrations took place including a clever performance by Mr. O. Holmes in a Piper Cub and Mr. Peter Gooch who offered the spectators "P/O. Prune's first solo," an amusing performance of prunish hamfistedness.

The spot landing and mock bombing competitions were carried out, the latter providing a lot of fun as each aircraft dive-bombed a tractor in the airfield whose driver nonchalantly disregarded the sawdust bombs falling around him. Mr. Peter Grant put up an excellent average with his three bombs and won the first prize. The second prize was won by Mr. Coltman. The spot landing was also won by Mr. Peter Grant in his Magister. The Air Rally was followed by a cheerful get together in the club house and dancing in the hangars.

DAKOTA REPLACEMENT: *The Vickers Valetta C. Mk. I with Bristol Hercules 230 engines is now in production for transport squadrons of the R.A.F. Developed from the civil Viking, the Valetta will replace the Dakota.*

SERVICE AVIATION

Bomber Command Training Flights

SIX Bomber Command aircraft from one station in each Group in turn will fly to Egypt every four weeks on a liaison and training mission. They will depart on the first of the month and return at the end of the month. The mission, known as "Operation Sunray," originated in July on a smaller scale, when three aircraft from various stations in turn flew out for a fortnight's liaison tour of Mediterranean and Middle East Command. The first station to send a flight of six aircraft to Egypt under the new scheme will be R.A.F. Upwood, Northants.

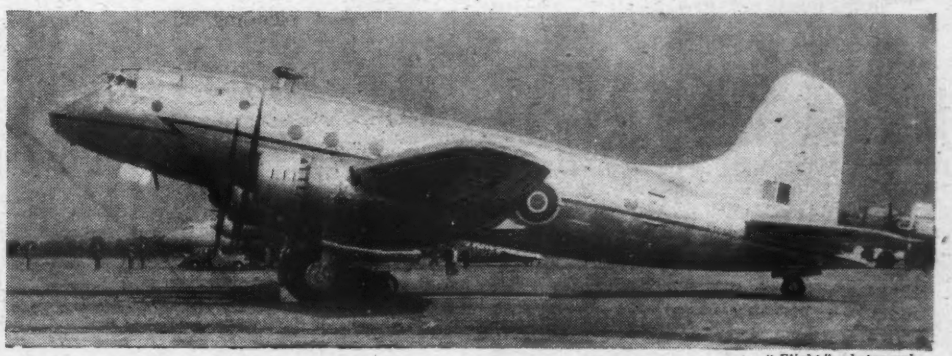
"Operation Sunray," in addition to enabling the aircrews to "show the flag" and work in liaison with Middle East Command is also designed to give them the opportunity to practice live bombing, fighter affiliation, and airfiring training with less interruption to flying than would be the case at their home bases during the autumn and winter months.

Royal Air Force and Naval Aviation News and Announcements

617 Squadron Home

NUMBER 617. SQUADRON arrived home at Binbrook from its 20,000-mile good-will flight to America and Canada on September 9th. There follows a brief account of activities in Canada before departure. One Lincoln was delayed by a technical defect.

The squadron left Andrews Field, Washington, on September 4th. On the way to Canada the Lincolns passed over Pittsburg, then Lake Erie and Salt Creek, arriving over the Canadian National Exhibition at Toronto at exactly 2 p.m. Great interest was shown by Canadians in the arrival and large crowds watched the aircraft flying in perfect formation as they crossed and recrossed the exhibition buildings. Led by F/L. Crowe, D.F.C., the Squadron peeled off for individual runs over the exhibition. Admiration was expressed by visitors as the aircraft roared over at a height of 300 feet and 250 m.p.h. On arrival at Trenton Airport the Squadron was greeted by A.V-M. E. Middleton, A.O.C., Central Air Command, R.C.A.F., A.Cdre. W. W. Brown, Chief Staff Officer Central Air Command, G/C. H. C. Rutledge, O.B.E., Commanding Officer, R.C.A.F. Station, Trenton, and A.V-M. Carnegie, Senior Staff Officer U.K., Air Liaison Mission. Personnel were entertained by citizens of Trenton on Tuesday and on Wednesday, squadron members visited the exhibition. Headed by an R.C.A.F. band they marched through a section of the exhibition while hundreds of visitors lined the roads, cheering and waving



HALIFAX "A" AND "C" REPLACEMENT: *The Handley Page Hastings C. Mk. I with Bristol Hercules 101 engines (seen here at Radlett) will replace the Halifax A. IX (airborne forces type) and C. VIII (cargo type) in the R.A.F.*

"Flight" photograph.

Service Aviation . . . .

flags. Officers attended a luncheon attended by the Canadian Minister of Agriculture, Mr. Thomas Kennedy, and Mr. J. Walter Jones, Premier of Prince Edward Island. In the evening they were entertained by the Toronto Pathfinder Club and many wartime friendships were renewed. Several fellow prisoners of war met for the first time since their release. Radio broadcasts at the exhibition were made by G/C. Thomson, W/C. C. D. Milne, S/L. C. K. Saxelby, and F/L.s Simpson, Shoreham and Deubert.

On Thursday five of the aircraft, led by W/C. Milne, flew past the exhibition carrying 17 news reporters, photographers and newsreel camera men. An airborne and ground radio recording was made from W/C. Milne's aircraft for C.B.C. international wavelengths. A R.C.A.F. helicopter carrying a C.B.C. commentator hovered over the exhibition giving a running commentary on the Squadron's history and outstanding personalities during the flypast. The Lincolns flew in Vic formation, then in line astern, echelon to port and starboard, and ended with a peel-off.

D. H. Devon

THE name Devon has been allocated to the R.A.F. version of the de Havilland Dove light transport aircraft.

Petrol Rationing in the R.A.F.

AS part of the national effort to save petrol the Royal Air Force, in common with the two other Services, is introducing a rationing system, and from this month supplies are being cut to make a substantial saving. The economies will be chiefly in motor spirit, where a saving of about 10 per cent is aimed at in all Home Commands except Maintenance Command (where the work of distributing equipment and disposing of surpluses cannot be delayed). The average monthly consumption in each of the first four months of this year has been taken as the basis upon which the reductions will be made. The present consumption of motor spirit in the Home Commands of the R.A.F. is about 12 million gallons a year, and it is hoped to save rather more than one million gallons.

Commands are reinforcing the current instructions that road vehicles are to be used as sparingly as possible, and in such a way that the maximum advantage is got from each journey.

So far as aviation fuel is concerned, there is less scope for economy since any reduction of flying hours below a certain limit is liable to lead to a loss of efficiency of flying crews with a risk of accidents.

Communications in Japan

FAST, reliable air communications are one of the first essentials of the British Commonwealth Occupation Force in Japan. Not only are internal links required between the separate units but also air transport for visiting generals and statesmen intimately concerned with the national issues of the occupation. To provide these communications there is based, at an ex-Japanese naval airfield near Iwakuni, on land reclaimed from the Inland Sea, a flight of Dakotas and Austers of the R.A.F. The crews fly regular services to other airfields in southern Japan, and to Tokyo, carrying passengers and top priority freight. Much of the internal distribution of mail in Japan is done by air. Passengers may be top-ranking generals or an airman posted from one unit to another. Whoever they are, wherever they want to go, the crews are ready to fly—in all but the worst weather. Passengers arriving in Japan from Hong Kong by Sunderland flying-boat or from Australia or New Zealand by No. 86 Royal Australian Air Force Transport Wing, reach their final destination within Japan by a Dakota of the British Commonwealth Air Force—B.C.A.I.R. for short.

Since the spring of 1946, when they began operations in Japan, Dakotas have flown more than 2,500 hours, carried over 2,000 passengers and 45 tons of freight. The short-range Austers have flown more than 1,675 hours, carrying one and sometimes two passengers every flight. Sunderland flying-boats used on the Iwakuni-Hong Kong link-up for the last six months have carried 1,600 passengers and 40,000 pounds of mail.

These figures are exclusive of record shuttle services flown by Dakotas immediately following the earthquake and tidal waves which caused havoc on Shikoku island a few days before Christmas, 1946. Every aircraft was pressed into service on this occasion and carried 6,000 pounds on every flight from Iwakuni to the stricken area. Auster pilots reconnoitred hundreds of miles of coasts, reported on broken railways, landslides and spotted marooned Japanese. In all, 84,486 pounds of supplies, made up of one jeep, 9,200 blankets, 5,250 men's jackets, 4,020 sets of children's clothing, and 3,000 sets of women's clothing were carried. In addition medical teams from B.C.O.F. military hospitals were flown in to alleviate suffering and aid Japanese doctors.

The "Royal Air Force Review"

ABLY and attractively produced, the first issue of the monthly *Royal Air Force Review* is now available to all serving members of the R.A.F. and W.A.A.F. and to those serving with the Auxiliary and Reserve units, the R.O.C. and A.T.C. The *Review* can also be obtained by former members of the Service, who can obtain their copies by postal subscription direct from the Air Ministry. The price is 6d.

R.O.C. Applications

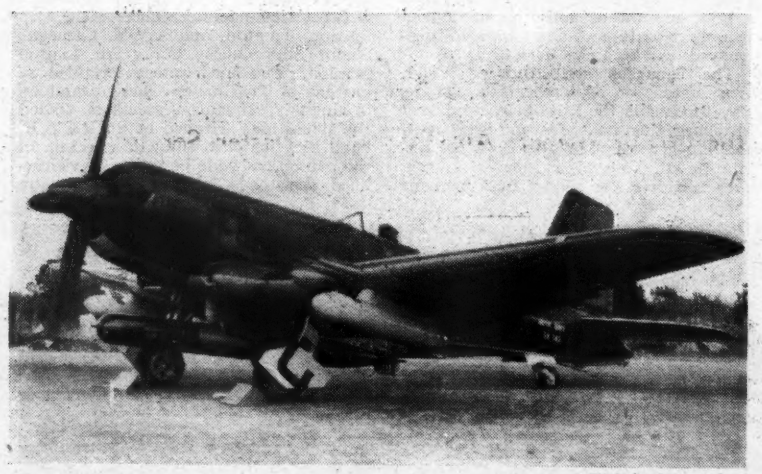
SINCE recruiting opened last November for the Royal Observer Corps, 11,162 men and 1,676 women have applied to join. Applications for enrolment at the end of August for the five R.O.C. areas are as follows:—

Southern area	2,768	men (August increase of 68)
	315	women (August increase of 3)
Midland area	3,633	men (August increase of 71)
	494	women (August increase of 6)
Western area	1,704	men (August increase of 33)
	254	women (August no increase)
North Western area	1,652	men (August increase of 54)
	323	women (August increase of 3)
Scottish area	1,495	men (August increase of 10)
	240	women (August increase of 10)

Recruiting is still open in all areas for both men and women. The lower age for new volunteers is 16, and the upper age limits are 45 for service at Centres and 50 for service at Posts.

Reunion

A Lyneham Reunion Stag Party will be held on October 10th at Williamson's Restaurant, 1 to 3, Grovelands Court, E.C.4, at 7.30 p.m. for 8 p.m. Tickets, 7s 6d, from J. W. Hicks, 76, Southwark Street, S.E.1.



"Flight" photograph

FULL LOAD: The Blackburn Firebrand T.F. Mk V was shown at Radlett last week complete with torpedo and auxiliary tanks. This type did not fly this year, giving place to the new S.28/43.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

ARNHEM FAILURE

Why 2nd T.A.F. and A.D.G.B. Fighters were Absent

I WAS interested to see in *Flight*, September 4th, the beginnings of a correspondence which may well throw some light upon hitherto obscure factors in the failure of the Arnhem venture. Permit me to provide an answer to one of Mr. Jeffrey Moss's rather sweeping statements.

The weather conditions locally in the Arnhem area on the days following the landing were indeed better than those in the fighter-base areas of Second T.A.F. or A.D.G.B. That aircraft could be operated over Arnhem by the Luftwaffe, who were operating over home territory from clear bases, was evident; but what could not be seen by the land forces was the condition of thick haze-fog reaching to 11,000ft which blanketed all fighter bases of A.D.G.B. within range of Arnhem, limiting horizontal visibility in most places to 700-1,000 yards, and which extended from the United Kingdom and the coast of France to a few miles beyond the Schelde.

These conditions made impossible the control of the thousands of fighter sorties necessary for close support of an operation of this magnitude. Close support sorties operating beyond close radio control were unable to pick up pinpoints owing to haze and never located their target areas. Then upon their return they had to be handled by control, not as single formations but as a whole series of individual emergency homings, to such an extent that the whole support programme broke down unavoidably. W/C. ROLAND BEAUMONT.

COCKPIT LAYOUT

Aircraft Bridge "Prehistoric"

THE only reason for trespassing again on your space in the matter of cockpit layout would be that continual banging of the drum may eventually persuade someone to do something.

When one reads a report on the application of the scientific method, as in your issue of August 14th, one is almost ashamed to realize that in such a marvellous device as the modern aircraft the most prehistoric compartment is the bridge.

Instructing some years ago at one of the first F.T.S.s to be re-equipped with Oxfords, I noticed that one of the reactions of most pupils to the then new blind-flying panel was a tendency to overbank in turns. I thought that perhaps the model aircraft on the artificial horizon might be too small, and that if its wing tips were extended to the circumference of the instrument a better appreciation of lateral level might result. In a rash moment I wrote to the company making the suggestion, but you will hardly believe what they replied. I was told that the movements of the model against the horizon wires were intended to convey performance in pitch, and that information in roll should be derived from the angular scale at the top.

At first I thought they were pulling my leg, but I later discovered that the great advantage of the instrument in providing observation of two axes at one glance had escaped them.

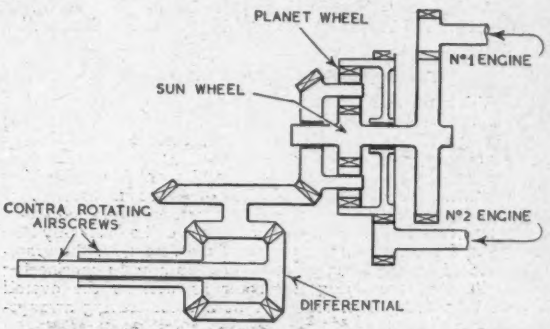
That, however, was in the bad old days when instrument flying was considered the occupation of fools or criminals. Things are different nowadays. Or are they?

"VERTIGO."

ENGINE ARRANGEMENT

Alternative to Long Shafting

IN his article in *Flight*, August 28th, Sir Roy Fedden suggests (Fig. 6) an aircraft with two engines in the nose and shaft drive to contra-rotating propellers in the tail. If the airframe



Suggested design for differential gear to couple two engines to contra-rotating airscrews.

designer is to provide space in the nose for *two* engines, surely contra-props coupled to the engines through a double differential gear and mounted in the conventional single-engine position would be far more simple than the fifty or sixty feet of shafting shown in his illustration. H. R. BARNARD.

ELEMENTARY TRAINERS

Specification Evolved by Empire Central Flying School

OBVIOUSLY it is not the place in your correspondence columns to discuss in detail the reasons behind an Air Ministry specification for any type aircraft, but I feel that "One-time A.2" and Mr. D. A. S. McKay must appreciate that before such a specification is issued the fullest consideration is given to all points of view.

The considerations which led to the adoption of a comparatively large cabin trainer with a third seat were arrived at mainly as the result of prolonged discussions by both staff and students at the Empire Central Flying School. In other words, the specification was based upon training needs as visualized by a practical body of service flying instructors with an intimate and expert knowledge of service training requirements. "One-time A.2" has been singularly unfortunate not to have met a single Service instructor who is aware of this fact. It is interesting to note that the "powers that be" appear to have accepted, in this instance at any rate, almost the entire recommendations made at user level.

In my opinion, the T.23/43 Specification quite rightly takes into account Service requirements solely, and its purpose is to take the pupil a great deal further along the training channel than would be possible in a type of aircraft

Correspondence . . . .

suited to club training. It will also, presumably, enable Volunteer Reserve pilots to keep refreshed at a much higher standard of applied flying than would be possible on Tigers.

Mr. McKay's concluding remarks concerning the advisability of starting off pupils on the easiest aircraft possible raises one of those arguments which appear to be useless to argue, for the simple reason that the supporters of the two sides are each more bigoted than the most hardened supporters of professional sport teams. I would merely say that a lot depends on what you mean by the easiest possible type, and that there is a school of thought which would like to see the Service *ab initio* trainer a quite different type in order to weed out the least apt pupils at the earliest possible stage.

After a lifetime in aviation, I still wonder at the conservatism of pilots and call to mind those who forecast the collapse of Service training when Smith Barry made the "dangerous" Avro 504 its *ab initio* trainer.

Finally, I would say that the Prentice version of the T.23/43 Specification is a pleasant and simple aircraft to handle. Its "complications" are its instruments, taps, etc., the use of which are probably best taught by a pupil's first instructor in whom he has the perfect faith never to be met with again.

The Airport, Luton. "STILL A.1."

Time Saved in Giving Instruction

I HAVE read with much interest the recent letters signed "One-time A.2" and "Donald A. S. McKay," discussing the pros and cons of the side-by-side, three-seat elementary trainer controversy.

I am greatly interested in this, since I spent long, gruelling hours during the war on all aspects of flying instruction. I am wondering if both of the recent writers have borne in mind one very important point in favour of both side-by-side seating and the inclusion of the third seat, namely, the precedent created by the Director of Flying Training in considering the welfare of the flying instructor as well as the overall benefit to training that either or both these seating arrangements have.

During the peak periods of wartime training—and it must be remembered that the T.23/43 specification was initiated at that period—the flying instructor often found himself the possessor of four to six students per six weeks' course. During this time each student was supposed to complete a period of 50 hours' flying, and the aim in each case was to ensure that the student spent half that time under dual instruction.

Due to the circumstances peculiar to the time, it could happen that all students had to be shown the same exercise in one day, involving endless repetition, in such wordy exercises as low flying, where the flying instructor found himself explaining several times in a day the optical illusions brought about by the effects of drift on an aircraft flying close to the ground. This individual form of flying instruction was the inevitable result of the two-seat tandem arrangement in vogue in Training Command at that time. This endless instructional repetition had a marked effect on the instructor and also on the quality of instruction, and there have been instances where operational pilots have preferred a second tour of operations to a sojourn at a Flying Training School.

The Director of Flying Training was quick to appreciate the bad effects of boredom and repetition. All flying instructors were aware of the desirable features of side-by-side training, as practised, for instance, in the Oxford aircraft, and so it became one of the prominent features of the T.23/43 specification. Thoughts were then turned to the inclusion of a third seat to enable a further student to benefit by holding a watching brief. Low flying, navigation, etc., could be demonstrated most ably to more than one student at a time so that when the second student's turn came to perform, much time had already been saved by listening-in to the demonstration given to the first student.

Investigation of this aspect of the specification proved that the quantity of the individual dual instruction could be reduced, which meant that each student in turn was at the controls for a longer period under the eye of his instructor. At the same time, by reducing the amount of flying instruction required to complete the syllabus, the instructor was able to introduce added variety with beneficial results to all concerned. PRE-WAR A.2.

FORTHCOMING EVENTS

Sept. 9th to 12th.—S.B.A.C. Exhibition and Display.
Sept. 13th to 15th.—Cannes Aero Club "Ailes d'Azur" Film Festival air rally, Cannes-Mandelieu airfield.
Sept. 14th.—Royal Aeronautical Society: Garden party, Radlett airfield.
Sept. 17th to 19th.—Federation Aeronautique Internationale: Annual General Conference, Geneva.
Sept. 19th.—Institute of Navigation: Inaugural Address by Sir Harold Spencer Jones, M.A., Sc.D., F.R.S. "Navigational Work of Nautical Almanac Office," D. H. Sadler, M.A. "Wind Statistics and their Application to Airline Operation," Capt. E. Brook Williams.
Sept. 20th to 22nd.—Butlin's air rally at Pwllheli Holiday Camp. Land at Broom Hall airfield.
Sept. 23rd.—R.Ae.S. (Graduate and Student). Discussion "The Design of Wings": Introduced by F. Tyson, A.F.R.Ae.S.
Sept. 25th.—Air league of the British Empire: Annual General Meeting, 1, Pall Mall East, S.W.1.
Sept. 27th.—Society of Licensed Aircraft Engineers: "Liquid Springs." R. H. Bound, F.R.Ae.S., M.I.M.E., A.M.A.E.
Oct. 19th to Nov. 24th.—Royal Aero Club of Belgium: Air rally to the Belgian Congo. Brussels to Le Kivu.
Oct. 21st.—R.Ae.S. (Graduate and Student). "Interplanetary Flight and Rocket Propulsion." A. V. Cleaver, A.F.R.Ae.S.
Nov. 1st.—Society of Licensed Aircraft Engineers: "Aircraft Pneumatics." H. R. Haerle.
Nov. 4th.—R.Ae.S. (Graduate and Student). "Maintenance Difficulties in the Field." M. J. Kemper, M.B.E., A.R.Ae.S.
Nov. 19th.—R.Ae.S. (Graduate and Student). "Aircraft Photography." John Yoxall.
Dec. 12th.—R.Ae.S. (Graduate and Student). "Aircraft Design from the Airline Point of View." Christopher Dykes A.F.R.Ae.S.

THE AEROTEC SPORTSMAN
Attainment of Stated Performance Questioned

THE announcement in your journal of September 4th of a new ultra-light aircraft project by the Aerotec Research Group will be of interest to private owners and flying clubs alike.

However, a number of the figures given in the report appear to raise doubtful points, and any clarification from the staff of Aerotec would, I think, prove helpful to your readers.

The landing speed mentioned is low, even for this class of aircraft, and as the Reynolds number must inevitably be in the region of 2×10^6 it appears that this can only be attained by the adoption of a very low wing-loading and consequent large wing area. With reasonable aspect ratio, a C_{Lmax} without flaps of 1.35 might be assumed, although this would probably entail a better surface finish than that obtainable by the amateur kit builder, and the corresponding wing-loading is 3.11 lb/sq ft. With semi-span split flaps the C_{Lmax} might be raised to 1.80, giving a wing-loading of 4.14 lb/sq ft. Now the all-up weight of this single-seater will presumably lie between 600 lb and 800 lb, giving a minimum wing area of 145 sq ft for 600 lb. A.U.W. and split flaps, an unlikely combination in view of the extremely light structure weight of this supposition: 600 lb − 170 lb (pilot) − 120 lb (engine) − 70 lb (fuel and oil) = 240 lb (inc. radio, etc.). The greatest probable wing area, that deriving from 800 lb A.U.W. and no flaps, is 257 sq ft, but this is also unlikely because of the disproportion of size to weight (cf. the Tipsy Junior, with 60 h.p. engine weighing 170 lb, A.U.W. 660 lb, wing area 113 sq ft and stalling speed 40 m/hr).

Whatever the compromise chosen, we are left to suppose a relatively large wing area, with correspondingly high induced drag figures. The tricycle undercarriage will also add to the parasite drag of the aircraft even if well trousered, and to attain a cruising speed of 100 m/hr an engine of approximately 60 h.p. would appear to be needed, even allowing very favourable drag figures. Apart from the difficulty of procuring a British engine of suitable weight and power, this would give a fuel consumption higher than that suggested. The figure of 18s for 300 miles will just cover the cost of eight gallons of petrol and oil; and gives a minimum performance of 37½ m./gallon, which could only be attained by a 40 h.p. engine at 0.5 lb/b.h.p./hr at the speeds quoted.

The cost of operating thus seems to be confined solely to petrol and oil, and no account has been taken of maintenance and inspection, C. of A., hangarage, insurance, landing fees or, more important still, first cost. The implication of the use of flaps, plus a tricycle and therefore braked undercarriage, indicates a fairly high first cost, even for a back-garden constructor. The two-way radio also implies the provision at least of electrical services, and the total weight of batteries, aerial, cable, etc., to be carried seems steep for the type of aircraft under consideration. The question of weight control, which appears to be the governing factor with this enterprising project, is also important when it is realized that a high-performance aircraft for "sporting" flying will doubtless be designed to A.R.B. Aerobatic Category, necessitating higher load factors than are used, say, for the current four-seater charter aircraft.

There is every indication that the Aerotec Research Group must have something up their sleeves, and fuller details of their design would be greatly appreciated. R. CHEATER.